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JOURNAL OF THE Society of Chemical Industry.

A RECORD

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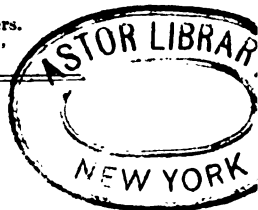
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Notices.

ANNUAL GENERAL MEETING, NEW YORK, 1904.

The Annual General Meeting will be held in New York City on Thursday, Sept. 8th, and following days. Members who propose to attend the meeting are requested to inform the General Secretary, as soon as possible, by what steamer they will travel. The principal boats will be met on arrival at New York by a representative of the Reception Committee, who will escort the guests to the Hotel Seville, Madison Avenue and 29th Street, which will be the Society's Headquarters in New York. A similar system will be observed at all the other cities visited by the special train. A revised programme appeared in the March 31st issue.

In accordance with the provisions of Rule 18 of the Bye-laws, notice is hereby given that those members whose names are printed in *italics* in the list of Council will retire from their respective offices at the forthcoming Annual Meeting.

Mr. Wm. H. Nichols has been nominated to the office of President under Rule 8; Dr. Edw. Divers, Prof. W. R. Eaton Hodgkinson, Mr. Max Muspratt, and Mr. T. J. Parker have been nominated Vice-Presidents under Rule 8; and Sir Wm. Ramsay has been nominated a Vice-President under Rule 11.

The Hon. Treasurer and Hon. Foreign Secretary have been nominated for re-election to their respective offices.

Members are hereby invited to nominate fit and proper persons to fill four vacancies among the ordinary members of the Council. Forms for this purpose can be obtained, on application, from the General Secretary, or from the Hon. Local Secretaries of the Canadian, New York, and Sydney Sections.

Extract from Rule 18:—"No such nomination shall be valid unless it be signed by at least ten members of the Society who are not in arrear with their subscriptions, nor unless it be received by the General Secretary, at the Society's Office, at least one month before the date of the Annual General Meeting at which the election to which it refers takes place. Nor shall any such nomination be valid if the person nominated be ineligible for election under Rules 12 or 15. No member shall sign more than one nomination form."

COMMUNICATIONS.

Authors of communications read before the Society, or any of its Local Sections, are requested to take notice that under Rule 43 of the Bye-laws the Society has the right of priority of publication for three months of all such papers. Infringement of this Bye-law renders papers liable to be rejected by the Publication Committee, or ordered to be abstracted for the Journal, in which case no reprints can be furnished to the author.

Changes of Address.

When notifying new addresses, members are requested to write them distinctly, and state whether they are temporary or permanent. Multiplication of addresses is also to be avoided as tending to create confusion. When sending subscriptions, the use of the form attached to the application helps in the verification of addresses, on which the safe delivery of the Journal depends.

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Deaths.

Aspinwall, Capt. H. C., of Haskell, N.J., at New York. June 28.

Hunt, Edwin, of Wood Green, Wednesbury, at Edgbaston. July 5.

London Section.

CORRECTION.

THE LOSS OF NITRE IN THE CHAMBER PROCESS.

BY J. H. K. INGLIS.

(This J., June 30th, 1904, 643—645.)

In the remarks of Mr. Oscar Guttman, in discussion (p. 645, col. 1), the following sentence occurs:—"Dr. Raschig, in the presence of Prof. Lunge and others, had demonstrated the correctness of his theory by analyses on the large scale."

Prof. G. Lunge writes, under date July 5th, that it might seem from the above that he had, by his silence, conceded the correctness of Raschig's views, but that this was not so. At the annual meetings of the Society of German Chemists, papers were only exceptionally followed by discussions, and, in this particular case, the lateness of the hour precluded any discussion whatever.

New York Section.

*Meeting held at Chemists' Club, on Friday,
May 20th, 1904.*

DR. V. COBLENTZ IN THE CHAIR.

METHODS FOR THE RAPID ESTIMATION OF BORIC ACID.

BY DR. MILTON F. SCHRAAK.

The estimation of boric acid has, until recent years, been attended by many difficulties. This has been chiefly owing to the fact that none of its compounds appear to possess the properties necessary for a satisfactory separation or gravimetric estimation.

In mineral analyses it was customary to determine the boron indirectly, or to estimate all the constituents of the mineral, and calculate the difference as boric acid.

Methods for the titration of boric acid were also lacking until it was observed by Thomson (this J., 1893, 433) that the addition of glycerol to solutions increased the acidic nature of boric acid to such a degree that accurate titrations could be made by using phenolphthalein as the indicator.

The method most in favour at the present time for the gravimetric estimation appears to be that of Gooch (Amer. Jour. of Science, 1899, 34; see also this J., 1887, 385). By this method the boric acid is liberated from its compounds by acetic acid, and heated with methyl alcohol, thus forming the volatile ester trimethyl borate, which is completely removed by distillation. The distillate is collected over a weighed amount of calcium oxide or sodium tungstate, by which the ester is decomposed; the boric acid becomes fixed, and, after ignition, is calculated from the increase in weight. This method, while appearing simple, yet requires great skill and patience for the attainment of accurate results.

The method of Berzelius, by which the potassium borofluoride is separated and weighed, was selected by Thuddeff (this J., 1898, 953) after an extended investigation of other methods. He recommends the isolation of the boric acid by distillation with sulphuric acid and methyl alcohol, collecting the distillate in aqueous solution of potassium hydrate, treating with hydrofluoric acid, potassium acetate, and alcohol for the separation of the potassium borofluoride, which is then weighed. Since the borofluoride

is not entirely insoluble in the mixture used, very accurate results cannot be expected; besides which, the operations are tedious.

Partheil and Bose (Ber., 1901, 3611) have suggested extracting the boric acid from its aqueous solutions by means of ether in a perforator, and weighing. The extraction requires 18 hours, and easily becomes complicated by the presence of other substances.

The most recent attempt to effect a gravimetric determination is that of Mylius and Meusser (Ber., 1904, 397; this J., 1904, 269), who sought to utilise the fact that boric acid possesses basic properties, and will react with acids. They selected a compound with phosphoric acid, boryl phosphate (BPO_4) and proceed as follows:—An aqueous alcoholic solution of boric acid is treated with ammonia and phosphoric acid, evaporated to dryness, and finally heated in an atmosphere of steam to assist in removing the excess of phosphoric acid before weighing as BPO_4 . The method has not yet been perfected, their results being only approximately accurate.

It is evident from the foregoing that the gravimetric methods available at the present time are not suited to the rapid estimation of boric acid, and recourse must therefore be had to volumetric methods.

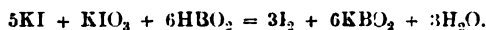
As is well known, aqueous solutions of boric acid are but slightly dissociated, and alkalis have an uncertain action in the presence of phenolphthalein as indicator, while methyl orange is practically not affected, and solutions containing free boric acid will react neutral with it.

The observation of Thomson, already mentioned, led to the use of glycerol to increase the acidic properties sufficiently for the titration in the presence of phenolphthalein.

Since that time the action of glycerol upon boric acid has been investigated at various times, and it has been shown that substances having hydroxyl groups all acted upon boric acid to a greater or less degree, and that it is probable that alkyl compounds are formed which are highly dissociated in the solvent, and which, according to the law of mass-action, are stable only in concentrated solution of the reacting substance; it is therefore necessary to employ a large excess of the alkyl base in proportion to the water present.

Glycerol and mannitol are the polyatomic alcohols most available for the purpose of the titration mentioned.

It has been shown by Jones (Amer. J. of Science, 1899, 127) that the alkyl compound with mannitol acts quite as energetically upon a mixture of potassium iodide and iodate as a mineral acid in liberating iodine according to the equation—



He has made this fact the basis of a method for the iodometric determination of boric acid (this J., 1899, 947).

Jones has also used a mixture of potassium iodide and iodate in conjunction with sodium hyposulphite to neutralise the free mineral acid in a borate solution previous to the titration with mannitol and phenolphthalein. The method has no advantage over the use of methyl orange to indicate the neutral point, and it is more complicated, and this is especially the case with his iodometric method.

A solution of boric acid in methyl alcohol acts almost like an aqueous solution, and can be titrated only after the addition of a polyatomic alcohol. Gladding (J. Amer. Chem. Soc., 1898, 288) has used this method for titrating the distillate obtained by distilling a borate with syrupy phosphoric acid and methyl alcohol.

The application of this method is rather limited, as no provision is made for operating in the presence of carbonates or volatile mineral acids.

The general application of the methods for the volumetric determination of boric acid in minerals and in presence of other substances is very desirable, and it is my purpose to point out several sources of possible error, and to present methods by which the interfering substances may be eliminated and correct results attained.

Of the methods thus far proposed for the volumetric determination of boric acid, it appears to me that the

employment of methyl orange to indicate the point at which all the boric acid in a borate solution has been liberated, and the subsequent addition of glycerol for the titration of the acid in the presence of phenolphthalein, can be relied upon to give results with rapidity and accuracy in all cases where the solution to be titrated is free from interfering substances. A type of this class of titration may be illustrated by the method now in general use.

I. To about 50 c.c. = 1—2 grms. borax, 1—2 drops solution methyl orange are added and standard acid until all the boric acid has been liberated, when the solution will react acid with the indicator. In the presence of a carbonate the acid solution is heated a short time with a reflux condenser until the carbon dioxide is removed. The solution is cooled and made exactly neutral to methyl orange, and an amount of neutral glycerol, equivalent to fully one third the volume of the solution at the finish, is added together with about $\frac{1}{2}$ c.c. solution phenolphthalein. The titration is then finished with standard alkali, which must be free from carbonate. The calculation is based upon the following equation:—



Borates insoluble in water are dissolved in dilute hydrochloric acid, in the cold or with a reflux condenser, and treated as in the foregoing.

This method will not give accurate results when aluminium salts are present, as the solution when neutral to methyl orange will contain free alumina, which will combine with the alkali when titrating with phenolphthalein and glycerol, and thus be calculated as boric acid. Iron salts, when present in considerable proportion, also interfere by obscuring the colour reactions of the indicators. There appears to be no combination of indicators known which will serve to prevent this error, and it therefore becomes necessary to separate the iron and aluminium from the solution before titrating.

Most of the minerals containing aluminium also contain small amounts of silica, and when an attempt is made to remove the aluminium by means of alkali carbonates, insoluble borates are formed, and therefore this method is unsatisfactory for the removal of the disturbing elements.

I have found that when barium carbonate in excess is added to a solution containing free boric acid with aluminium and iron salts, all the latter will be precipitated and can be removed by filtration, while only a slight portion of the free boric acid will react with the barium carbonate and pass into solution as borate, and this can again be decomposed by the addition of acid. Upon this observation I have based the following method (II.):—

A convenient amount of the substance is placed into a flask with an excess of dilute hydrochloric acid, and heated with a reflux condenser for solution. After cooling, the solution is brought to a definite volume and filtered. 100 c.c. of the filtrate, which may represent 2—4 grms. substance, are brought almost to the neutral point of methyl orange with alkali, 2—3 grms. barium carbonate are then added, and the solution warmed on the steam-bath $\frac{1}{2}$ hour, cooled, brought to 200 c.c., and filtered. The solution will then be free from the interfering substances, and may be titrated as in I.

This method has been found to be well suited for the rapid assay of the various natural compounds of borate of lime, such as colemanite and pandermite, which usually contain small amounts of alumina and silica, iron, magnesia, and gypsum.

In cases where it is desirable to have the boric acid free from other substances before titration, I have found, after investigation, that distillation with methyl alcohol and titration of the distillate can be accomplished with rapidity and accuracy, and that the interference of volatile mineral acids or carbon dioxide can be eliminated.

A study of the properties of methyl borate shows that it is immediately decomposed into its components upon contact with water. This fact led to the introduction of water into the receiver, which at once leads to the formation of free boric acid, and the chances for loss at this point are thus minimised. It also suggests that the use of concentrated sulphuric acid and the exclusion of water during the

distillation will secure freedom from hydrolytic action and thus lead to the greatest rapidity of distillation.

As already mentioned, solutions of boric acid in methyl alcohol may be titrated like aqueous solutions. When, however, mineral acids or carbon dioxide are present, they cannot be eliminated as in water solutions.

I find that mineral acids in the methyl alcohol distillate may be neutralised with alkali, previous to the titration of the boric acid in presence of glycerol, by the use of methyl orange or Congo red test-papers. By spotting upon Congo red test-paper, 0.1 c.c. N/5 acid to 100 c.c. methyl alcohol may be detected. Organic acids which would interfere can readily be excluded from the substance. The carbon dioxide can be removed by heating the substance with sulphuric acid before the distillation.

III. The apparatus for distillation may conveniently be arranged as follows:—A long wide-necked 200 c.c. Kjeldahl flask may serve as the decomposing flask. This flask is fitted with a stopper carrying three tubes, one of which serves to connect it with a condenser in such a manner as to avoid any of the acid liquid being carried over during the distillation. Another tube is to be connected with a flask for supplying a current of methyl alcohol vapour which is to be conducted to the bottom of the decomposing flask, thus serving to keep the mixture agitated and avoid bumping during the distillation. The third tube serves to introduce the methyl alcohol needed to form the mixture with the sulphuric acid and the substance, and may also be fitted with a clamp and valve for equalising the pressure when needed. The receiver which is to be connected with the condenser is trapped with a Mohr's bulb.

For the estimation a portion of the dry, finely pulverised substance is placed into a long narrow tube and weighed. The contents are then emptied into the decomposing flask, without allowing any of the substance to remain in the neck of the flask. The tube is now weighed again, the difference being the amount of substance used for the estimation.

A sufficient amount of concentrated sulphuric acid is added to form a thin paste with the substance, and the flask heated gently to expel carbon dioxide or other volatile acids, and cooled.

About 60 c.c. of water are placed in the receiver, the terminal tube of the condenser being made to dip into the water. The Mohr's bulb is also filled with water and attached as a trap to the receiver. The decomposing flask, containing the cold mixture of the substance and sulphuric acid, is now connected with the flask for the generation of methyl alcohol vapour, and with the condenser, all the connections being air-tight.

The distillation is then started by adding to the decomposing flask, in one portion, sufficient cold methyl alcohol to equal about 20 times the amount of free sulphuric acid present. Methyl alcohol vapours are then passed from the generating flask until the boric acid has all passed into the receiver.

During the distillation the decomposing flask is heated to a temperature sufficient to prevent any marked change of volume of the methyl alcohol which was originally added.

The distillation will usually be complete in about 30 minutes, when the receiver can be changed, and, to ensure complete removal of the boric acid from the substance, a further distillate collected and tested.

The water from the Mohr's bulb is added to the distillate, which is then neutralised with alkali, when necessary, by the aid of Congo-red or methyl orange test-paper. The titration is then completed after the addition of neutral glycerol and phenolphthalein as in I.

When pure methyl alcohol is used and care is taken not to allow the mixture with sulphuric acid in the decomposing flask to become concentrated, accurate results can be attained, even in the presence of large amounts of chlorides and carbonates. Fluorine, when present in large amount, must be removed from the substance before distillation. Borates which are not decomposed by concentrated sulphuric acid are treated by suitable methods of fusion before distillation.

The following results of the assay of several samples of commercial borate of lime will serve to illustrate the value of the three methods. The results by Method I. are

erroneous, except with the crystal colemanite, which is free from the impurities mentioned:—

Substance.	Methods.		
	I.	II.	III.
	% B_2O_3 .	% B_2O_3 .	% B_2O_3 .
Colemanite (impure)	41.2	40.7	40.68
" "	33.12	32.46	32.34
" "	34.61	34.12	34.00
" (transparent crystal)	40.00	38.31	38.33
Yandermite (impure)	50.71	50.70	50.78
" "	27.81	27.24	27.10
" "	44.14	44.00	43.86

Nottingham Section.

Meeting held at Nottingham, on Wednesday,
March 30th, 1904.

MR. J. T. WOOD IN THE CHAIR.

NOTES ON PETROLEUM SPIRIT OR BENZINE.

BY H. STANLEY GARRY AND H. J. WATSON.

The distillation fractions of crude petroleum which are collected between certain arbitrary ranges of temperature

yield a variety of products which are sold in commerce under the trade names of petroleum ether, gasoline, benzene, ligroin, or light petroleum. These are colourless mobile liquids used as solvents for gums and resins, for removing grease from textile fabrics, wool washing, paint mixing, and in preparation of varnishes, manufacture of oil-cloth, preparation of alkaloids, extraction of oils and fats in the leather and rubber industries, and in dry cleaning. The requirements of these trades vary considerably as to the character of spirit required, but it is more especially with regard to the range of boiling points of the spirit than the specific gravity of it that this variance exists, and to this particular phase of industrial requirements we would direct attention in this discussion.

Speaking generally, those qualities of naphtha which have come into the most common use are the naphthas of medium gravities and in which the range of boiling points is limited to about 40° C. In dealing with petroleum spirit for extractive purposes there is very considerable difficulty in arriving at any satisfactory basis of examination of samples. Specific gravity is of little assistance, as the effect of the spirit depends principally on the range of boiling points. The success of the operation in bulk depends on the restriction of the boiling points to the possible temperatures at which the operation can be conducted in the first place, and secondly to the recovery of the spirit from the extract.

It is practically impossible to obtain a petroleum spirit possessing the special range of boiling points suitable to any particular material to be treated unless the spirit has been prepared by a special distillation beforehand and the extremes eliminated. It is possible, however, to obtain a petroleum spirit which will either commence fractionating

TABLE A.

	1. American Benzoline.	2. American Benzine.	3. Sumatra Spirit.	4. Scotch Shale.	5. Borneo Spirit.
Specific gravity at 15° C.	0.697	0.727	0.710	0.739	0.782
Condensation commenced at . .	54° C.	64° C.	60° C.	65° C.	65° C.
Volume distilling below 60° C.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
" " " 70° C.	1	0.5	15	0.5	1.5
" " " 80° C.	5	1.5	17	1	1.5
" " " 90° C.	18	8	20	1.5	3
" " " 100° C.	36	18	9	5	14
" " " 110° C.	14	36	14	12	26
" " " 120° C.	8	16	9	24	22
" " " 130° C.	6	8	3	18	12
" " " 140° C.	3	6	2	20	10
" " " 150° C.	2	4	1	10	6
" " " above 150° C.	1	2	..	8	4
	100	100	100	100	100

Apparatus.—Glinzky's dephlegmator—rate, one drop per second; Liebig condenser; flask, 200 c.c. capacity; thermometer in vapour only; sand-bath with flask immersed to height of liquid in flask; Bunsen burner.

TABLE B.

Spirits generally described as Deodorised, &c., but no Special Designation.

Specific gravity.....	0.680	0.680	0.700	0.700	0.700	0.730	0.730	0.740
Condensation commenced at	42° C.	37° C.	45° C.	44° C.	33° C.	82° C.	70° C.	80° C.
Per cent. under 50° C.	3.6	9	2	1	5	..	..	..
" " " 60° C.	10.4	15	3	3	10	..	..	..
" " " 70° C.	17	18	14	16	11	..	..	..
" " " 80° C.	15	18	23	21	14	..	2	..
" " " 90° C.	17	12	21	20	13	..	2	..
" " " 100° C.	12	7	17	18	11	6.8	13	..
" " " 110° C.	9	8	10	9	9	30.2	19	15
" " " 120° C.	11	4	3	4	9	34	17	23
" " " 130° C.	4	5	5.5	6.5	4	16	10	14
" " " 140° C. ....	..	3	..	..	4	9	15	21
" " " 150° C. ....	..	..	..	..	5	3	8	11
" " " 160° C. ....	..	..	..	..	3	..	4	5
" " " above 170° C.	1	1	1.5	1.5	2	1	4	6
	100	100	100	100	100	100	100	100

Apparatus.—Wurtz flask, 3 bulbs; rate of distillation, one drop per second; ordinary condenser.

at the minimum of the range required, in which case the heavier portion of the spirit may be rejected by stopping the distillation at the maximum temperature; or, alternatively, a spirit may be obtained finishing at the maximum temperature, in which case the distillate up to the minimum of the range is rejected.

Tables A and B give comparative analyses by fractional distillation of samples of petroleum spirit from different sources, showing the variations in range of boiling points of the principal grades of petroleum spirit now on the market.

Table B gives typical analyses of a number of benzines of different specific gravities, and is a fair experience of the variations in boiling point to be met with in commercial spirit.

Taking the limit of the range of boiling points at 40° C., it will be seen that none of these samples in Table A will satisfy this requirement, there being an excess under and over this range. In many cases the only solution of the matter is for the purchaser to distil the spirit to his own requirements. The effect of different designs of apparatus for conducting the fractional distillation, both in samples and in bulk operations, is very marked, as is shown by Tables C and D.

The following table shows the difference resulting in the employment of three different vessels for distilling the same spirit in simultaneous distillations:—

TABLE C.
Specific gravity, 0.700.

	A.	B.	C.
	Per Cent.	Per Cent.	Per Cent.
Per cent. distilling below 60° C.	6.5	12.8	20.9
" " " 70° C.	40.1	40.7	43.7
" " " 80° C.	76.1	65.1	66.0
" " " 90° C.	85.0	84.4	84.7
" " " 100° C.	93.0	92.6	92.1

A. Ordinary flask 2½ inches from side tube to swell of sphere.

B. Wurtz flask, 3 bulbs, 6 inches in length from side tube to swell.

C. Plain tube, 34 cms. from side tube to swell, and having a distance of 8.5 cm. of glass beads in tube.

The rate of distillation in each case was 1½ to 2 c.c. per minute.

It was found in practice that the effect of the glass beads was analogous to the return tubes, but that the retention of the heavier volumes was considerably facilitated by the obstruction of the beads. Care, however, is required in manipulation or there is a rush of spirit when nearing the end of the distillation.

TABLE D.

Tests on a Sample of Spirit, 0.730 sp. gr., with different Forms of Apparatus.

	N.	O.	P.	Q.	R.	S.	T.
Condensation commenced at.....	63° C.	68° C.	58° C.	58° C.	73° C.	64° C.	83° C.
Below 70° C.	0.5	0.5	2.5	2	..	1	..
" 80° C.	3.5	2.5	9.5	17	4	12	..
" 90° C.	44	44	37	26	38	35	1
" 100° C.	32	28	27	30	34	23	44
" 110° C.	16	15	15	15	15	13	43
" 120° C.	5	5	3	4	5	4	5
" 130° C.	1	3	3	2	2	2	2
" 140° C.	1	2	2	2	1	2	..
" 150° C.	1	1	1	2	1	1	1
Above 150° C.	0	0	0	0	0	0	2
	100	100	100	100	100	100	100

N.—Engler flask; 3½ inches from side tube to swell of sphere. Fixed in sand bath. Vapour readings.

O.—Ladenburg's flask; 7½ inches from side tube to swell of sphere. Fixed in sand-bath. Vapour readings.

P.—Le Bel-Henninger's dephlegmator (three bulbs), with a glass head to substitute platinum gauze cones; 15 inches from side tube to bottom of dephlegmator. Flask fitted in sand-bath. Vapour readings.

Q.—Le Bel-Henninger's dephlegmator (three bulbs), no obstruction whatever. Flask fitted in sand-bath. Vapour readings.

R.—Bannow's method; 4½ inches from side tube to bottom of dephlegmator. Vapour readings.

S.—Glinsky's dephlegmator (five small bulbs); 11 inches from side tube to bottom of dephlegmator. Flask fitted in sand-bath. Vapour readings.

T.—Glinsky's dephlegmator, as above. Liquid readings.

The rate of distillation in each case, 2½ c.c. per minute condensation commenced, taken from appearance of first drop of distillate.

There are also marked variations in the distillations of the same spirit taken at different fractions and at one continuous distillation due to the carrying over of the heavier spirit at the earlier stages. Of this Table E gives a striking illustration.

The distillates from eight separate distillations of the same spirit were collected between the following ranges of temperature:—Below 70° C., between 70° C. and 80° C., between 80° C. and 90° C., above 90° C. These were marked V, W, X, and Y, and subjected to distillation in the same apparatus. Below is the result of these distillations with the fractional distillation of the original spirit, and the calculation back from the distillates to the original spirit:—

TABLE E.

	U.	V.	W.	X.	Y.	Z.
	Original Spirit.	Fraction below 70° C., 42 per Cent. of Original.	Fraction between 70° 80° C., 21 per Cent. of Original.	Fraction between 80°—90° C., 17 per Cent. of Original.	Fraction above 90° C., 20 per Cent. of Original.	Calculated from Distillates to Original Spirit.
Specific gravity.....	0.697	0.675	0.697	0.718	0.737	..
Condensation commenced at.....	47° C.	45° C.	47° C.	60° C.	78° C.	..
Below 50° C.	0.5	29	0.5	..	..	12.285
" 60° C.	12.5	19	2.5	..	..	8.505
" 70° C.	29	25	25	3	..	16.89
" 80° C.	21	14	41	28	0.5	10.33
" 90° C.	17	7	17	39	4	13.94
" 100° C.	8	3	7	17	43.5	14.32
" 110° C.	6	2	2	8	31	9.42
" 120° C.	5	1	2	3	9	3.15
Above 120° C.	1	0	6	2	9	2.14
	100	100	100	100	100	100

Apparatus.—Glinsky's dephlegmator; 200 c.c. flask embedded in sand bath; working on 100 c.c. of spirit.

The comparative test of the eight separate distillations with the distillation of 500 c.c. of the original spirit compared as follows :—

Specific Gravity, 0.697.

	Volume per Cent. Eight Fractions.	
Commenced at.....	38° C.	47° C.
Below 50° C.	0.6	0.5
" 60° C.	14	12.5
" 70° C.	27	29
" 80° C.	17.4	21
" 90° C.	19.4	17
" 100° C.	9	8
" 110° C.	6.6	6
" 120° C.	4	5
Above 120° C.	2	1
	100	100

Considerable diversity of opinion exists as to whether the thermometer readings should be taken with the thermometer in the vapour or in the liquid. In Table F. these differences are fully set out by simultaneous observation.

TABLE F.

Sp. Gr.		Vapour.	Liquid.	Per Cent. by Volume of Distillate.
		° C.	° C.	
A 0.730	Distillation started	85	85	..
	Fraction below	90	100	50
	" "	100	109	23
	" "	110	118	14
	" "	120	131	7
	" above	120	131	7
B 0.736	Distillation started.	65	110	..
	Fraction below	90	114	6
	" "	100	120	11
	" "	110	126	20
	" "	120	138	23
	" above	120	138	40
C 0.777	Distillation started	90	162	..
	Fraction below	90	102	0
	" "	100	110	43
	" "	110	117	42
	" "	120	132	64
	" above	120	132	64

The fractional distillation of the spirit on small lots, owing to the effect of these variations, renders it generally desirable for the purchaser to arrange for the distillation of the spirit to his special range of boiling points beforehand in order that it may be carried out on a large scale, and so give a fairly average distillate.

There are a number of firms who undertake the distilling of spirit, but the experience of the writers is that no two firms can agree upon the range of boiling points, and there is considerable discrepancy in the results obtained.

There is urgent necessity for the adoption of a standard test for petroleum spirit similar to that adopted for benzol, which would considerably simplify the labour of further researches into the characteristics of the spirit.

The carrying out of experiments or tests of the range of boiling points should in all cases contain the particulars of the volume of the distillate as compared with the original sample and should be possible of comparison as set out in Table E.

There are very considerable differences in the working characteristics of petroleum spirit, which are not measurable either by specific gravity or range of boiling points and which are due both to blending and to inefficient distillation of the original spirit. The principal variations in petroleum spirit occur up to 100° C., as appear from the foregoing tables, as also from Sidney Young's results given in his book on "Fractional Distillation." An

apparatus constructed for laboratory tests, should as far as possible approximate to the apparatus for bulk operations, and the adoption of the form of still should provide for such construction and obstruction as will retard the passing of the heavier portions with the more volatile vapours. In large scale operations this is to a large extent provided by the material operated upon.

In the selection of a spirit for the special requirement of an extractive process the conditions of the bulk operating should as far as possible be reproduced in the laboratory, the moisture in the material, density and obstructions to vaporisation in bulk plant should be taken into consideration.

DISCUSSION.

The CHAIRMAN said that he had had some experience in the use of petroleum spirit for taking out grease from skins and leather. The advance made in degreasing skins was due in the main to the experiments carried out by Mr. F. N. Turney, which resulted in the erection of the plant at Whitemoor. The work that had been done in England had not been fully recognised. The main point of the paper so far as the use of petroleum spirit was concerned, was to be found in the sentence "there are very considerable differences in the working characteristics of petroleum spirit, which are not measurable, either by specific gravity or range of boiling points, but which are due both to blending and to inefficient distillation of the original spirit." This was a very abstruse question which had been partly discussed by Professor Young in his book on Fractional distillation, but he (the Chairman) could confirm what the authors of the paper said on the point. He had collected some figures from analyses made eight or ten years ago. The vapour tension of the spirit was more important than any other of the physical properties. He had made a great number of tests in the vapour-tension of spirits of varying gravities, and in some cases the spirit with the highest vapour tension had also the highest gravity, and a spirit with low gravity might have also a low vapour-tension. In certain mixtures the vapour given off was of less tension than one would anticipate from the gravity. Had Mr. Garry any data bearing upon that part of the question? He had had no practical experience with Russian petroleum, but in the Compagnie de Degraissage de St. Denis, he believed, they used a Russian spirit coming over below 110°, and so far as he knew they had no difficulty with it. The point he mentioned about the vapour-tension or vapour pressure, was important in the recovery of the spirit. In the apparatus in question there was a large tank in which skins were suspended, they were washed with spirit, and then dried in a current of warm air. When they were thoroughly dried the valve between the tank and the spirit was shut off preparatory to opening the tank and getting the skins out. Enclosed in the tank was a certain amount of vapour, which it was impossible to condense. The amount of this vapour depended of course upon the vapour pressure of the spirit used. The tank must be opened to the air to get the skins out. There were perhaps several hundred cubic feet of air charged with the vapour of petroleum, that was all lost. The smaller the vapour-tension in the spirit, the less they lost in that way, and if they were opening seven or eight tanks a day, they lost a great deal of spirit, although the apparatus might be in perfect working order. In working with chloroform, the solvent had been recovered by passing the vapour through a tower in which oil was falling. The oil absorbed the vapour which was afterwards recovered by distillation.

Dr. KIPPING and Messrs. ARCHBUTT and TROTMAN agreed that the adoption of a standard method for the distillation test was desirable. There should be no difficulty about this, as Mr. Archbutt pointed out that years ago the most minute directions were laid down for the distillation test of coal-tar benzenes.

Mr. H. S. GARRY, in reply, said, so far as he knew, most of the research work done in England had been done at Whitemoor. All he knew about the matter from a commercial standpoint had been gained by experience and not from college study. He had not seen any literature on the subject up to the time Professor Young published his book. There was a good deal about petroleum spirit which

nobody seemed to understand. The notes were put forward in order to urge the necessity in having a reliable method for estimation for boiling points. The petroleum trade had, so far, adopted no specific method.

Scottish Section.

Meeting held at Glasgow, on Tuesday, Dec. 1st, 1903.

MR. H. BUMBY IN THE CHAIR.

A COMPARISON OF DIFFERENT TYPES OF CALORIMETER.

BY THOMAS GRAY, Ph.D., D.Sc., AND JOSEPH G. ROBERTSON, Ph.D.

The experiments here recorded were instituted with the object of ascertaining the degree of accuracy of the calorific values of coal obtained by the Lewis Thompson and Wm. Thomson calorimeters by comparison with those determined by combustion in compressed oxygen. Some of the results of the work were communicated to the Scottish Section on Dec. 1, 1903, but publication was delayed in order to complete the series. Whilst the experiments were in progress, a paper dealing with the same subject appeared in this Journal (Brame and Cowan, 1903, 1230); but although our conclusions were largely anticipated by these authors, we decided to complete the work, as the experience gained with a larger number of coals of a different character would probably prove of general interest. As the previous publications referring to the comparative values obtained with different calorimeters have already been reviewed by Brame and Cowan (*loc. cit.*), we may proceed at once to give the results of our experiments.

The designations and sources of the coals used are given below (page 707). Numbers are attached for purposes of reference.

The samples were passed through a hand mill, thoroughly mixed, and air-dried to prevent, as far as possible, any change of composition on exposure to air in the subsequent operations.

The Lewis Thompson Calorimeter.—A standard thermometer graduated in $1/10^{\circ}$ C. was used with this instrument and the temperature was read to 0.01° C. The coals were very finely ground to facilitate complete combustion, and at least four experiments were made in each case with 11 parts of the oxidising mixture to 1 part of coal. Coals 1 to 8 burned quietly and regularly, with 9, 10, and 11 the combustion was very rapid, but attempts to burn the anthracite were all unsuccessful. In some experiments the coal failed to ignite, and when ignition did take place the combustion stopped before the mixture was completely burned. The combustion was finally effected by using a mixture of equal parts of the anthracite and a bituminous coal, the calorific value of the latter as determined with the Lewis Thompson calorimeter being used in calculating the value for the anthracite. As the object of the experiments was to ascertain the degree of accuracy of the method as it is usually carried out, the amount of unburnt carbon was generally not determined. This determination complicates the method and removes the only advantage which can be claimed for the Lewis Thompson apparatus, viz., simplicity of manipulation. Except in the case of the anthracite the amount of unburnt carbon was small. Further reference to this point will be made under the discussion of the results.

The proportion of oxidising mixture was increased in the case of the quicker burning coals, but the calorific value was not raised thereby. Seven experiments with Kilsyth coking coal, using 11 to 13 parts of the mixture per 1 part of coal, gave results varying to the extent of 88 calories = 1.2 per cent., whilst the mean was 7 per cent. below that obtained by the bomb. This difference between the extreme

results is not greater than that observed using a fixed proportion of the oxidising mixture. In the case of the sample of anthracite, on the other hand, a higher value was obtained by increasing the proportion of the oxidising mixture. The figure in the table (page 707) is the mean obtained using the ratio 13:1. As the combustion of the Kilsyth coking coal proceeded very rapidly there was a possibility of loss of heat through imperfect cooling of the products. Four estimations were accordingly made with the addition to the mixture of 1 to 2 grms. of ignited kaolin; the rate of combustion was reduced thereby, but the mean result was slightly lower than that previously obtained.

The differences between the extreme values in each series varied in the case of the bituminous coals from 0.5 to nearly 3 per cent. These differences are smaller than those observed by Brame and Cowan, and this result is probably due to the difference in the character of the coals experimented on, and partly also to the finer state of division in which they were used. With the sample of anthracite the difference between the extreme results reached 4.5 per cent., which agrees more closely with the observations of the authors referred to.

The William Thomson Calorimeter.—The water value was calculated from the weights and specific heats of the various materials. For the estimation of the weight of the glass beaker in contact with the water the method used by Thomson (this J., 1886, 584) was followed, the level of the water in the calorimeter-beaker having been marked with the combustion chamber and stand immersed.

The coal was burned in the form of compressed pellets in order to prevent the irregular combustion which was observed when the coal was used in the powdered form; the danger of loss through particles of coal being blown out of the crucible by the rapid current of oxygen was also avoided in this way. The coals all readily cohered on pressing, with the exception of the anthracite, which was compressed with admixture of an equal weight of Kilsyth coking coal.

The ignition of the coal was effected electrically. For this purpose two insulated copper wires were passed through the bottom of the metal stand into the glass combustion chamber, with the ends about half an inch apart and level with the top of the platinum crucible. The ends of the wire were connected by means of a piece of fine platinum wire to which a piece of cotton yarn was fixed, the other end of the cotton being tied round the coal peller. The combustion chamber was allowed to stand in the water for 10 minutes, after which the coal was ignited by the passage of an electric current sufficiently strong to fuse the platinum wire instantaneously. By this arrangement errors due to handling the apparatus before immersion in the water were avoided, and the ignition of the coal was effected with greater certainty. A correction was made in each case for the heat of combustion of the fuse.

In one series of experiments a standardised Beckman thermometer graduated in $1/100^{\circ}$ C. was used. A thermometer of this type is, however, not always available, and is rather delicate for technical work. For the sake of comparison a series of experiments was therefore carried out, using the thermometer reading directly to tenths, already referred to under the description of the Lewis Thompson method.

The Cooling Correction.—This is determined by Thomson (*loc. cit.*) by allowing the apparatus to stand at the end of the experiment for a period equal to the duration of the combustion; the fall of temperature which takes place is added to the observed rise. This correction assumes the temperature to have its maximum value during the whole period of the combustion, and is therefore obviously too high. With an imperfectly insulated vessel, such as that under discussion, an exact estimation of the loss of heat in the course of an experiment extending over 8 to 10 minutes is scarcely practicable. As the temperature rises uniformly during the combustion, the method of compensation first proposed by Rumford is applicable, and by starting with water having a temperature as much lower than that of the room as it will be above that of the surroundings at the end of the experiment, the necessity of applying a correction for loss of heat is obviated. The rise in temperature is

usually known approximately, and in any case can be determined by a preliminary experiment. This method of operating is sufficiently accurate for all practical purposes if an ordinary thermometer with a small mercury reservoir is used, as the maximum temperature is quickly attained; but with a Beckmann thermometer a slight modification is advisable on account of the lag caused by the large volume of mercury. In the latter case the rise in temperature at the end of the combustion was noted before the water was admitted to the combustion chamber, and from this the initial temperature of the water to be chosen in future determinations was fixed; the time which elapsed before the thermometer indicated the maximum temperature, after admission of the water to the chamber, was observed; and the fall of temperature which took place when the apparatus was allowed to stand for the same period after the maximum had been reached, was added to the observed rise. Thus correction was usually 0.010° to 0.015° C.

The oxygen used for the combustion was saturated with water vapour by passage through a wash-bottle, followed by a tower containing pumice soaked in water. As the oxygen entered the calorimeter at the mean temperature prevailing during the experiment, it may be assumed without appreciable error that it gave up to the calorimeter during the first half of the combustion as much water vapour as the products of combustion carried away during the second half while the temperature of the water was in excess of that of the surrounding air. Even when water of the air-temperature is used at the beginning of the experiment, no considerable error is committed by neglecting this correction. If we suppose that oxygen saturated with water vapour at 15° enters water at the same temperature and that the temperature at the end of the operation is 19° C., we may assume that the oxygen leaves the water with an average temperature of 17° , and on this basis calculate approximately the loss of heat due to evaporation. One cubic metre of oxygen saturated with water vapour at 15° and at 17° C. contains respectively 12.74 and 14.38 grms. of water, and the amount of heat necessary to convert the difference between these two weights of water into vapour at ordinary temperature is $1.64 \times 600 = 984$ calories. The amount of oxygen used for the combustion may be

taken to be about 10 litres, and the heat loss due to evaporation under these conditions will therefore be approximately 10 calories. The amount of heat necessary to raise the temperature of the excess oxygen and the products of combustion through 2° C., calculated from the specific heats O_2 0.217, CO_2 0.203, and water vapour 0.480, does not exceed 10 calories, so that the total correction to be applied for these two losses will be less than 20 calories. As has been already explained, loss of heat from these two causes was obviated by the method of working.

Three determinations were made with each coal, using the fine thermometer. The difference between the extreme values obtained for the individual coals varied from 0.3 to 1.5 per cent. The average difference for the 12 samples was 1 per cent.

The differences observed with the thermometer graduated in $1/10^{\circ}$ C. were somewhat greater, as was to be expected. The temperature in this case was estimated to $1/100^{\circ}$ C., and assuming reading errors of this order at the beginning and end of the experiment in opposite directions, the value for the observed rise of temperature would be infected with an error of ± 0.02 ; there is thus a possible difference of 0.04° C. between the results of two experiments due to incorrect reading, and this is equivalent to rather more than 80 calories. Although this is an extreme case, such differences from this cause alone are possible, and this additional error necessitates a larger number of experiments. In all cases at least four determinations were made, and in some cases six to eight were necessary. The mean of all the results was taken.

The mean results obtained with the two thermometers are given below, and in the third column are tabulated the mean calorific values calculated from the water equivalent of the apparatus, based on the results of the combustion of Kilsyth coking coal in the bomb and Wm. Thomson calorimeters; six combustions were made with the latter, and the mean result was adopted. This method of determining the water equivalent of the Wm. Thomson apparatus gives a high result, as there is unmistakable evidence of incomplete combustion in every case, but the adoption of the value thus obtained approximately corrects for the small quantity of gas which escapes unburnt.

	1.	2.	3.	4.	5.	6.
1. Thermometer in $1/100^{\circ}$ C.	5.990	6.352	6.662	6.858	6.965	7.134
2. Thermometer in $1/10^{\circ}$ C.	6.013	6.385	6.616	6.690	6.859	7.174
3. Using water value from combustion results	6.065	6.492	6.739	6.742	7.053	7.224

	7.	8.	9.	10.	11.	12.
1. Thermometer in $1/100^{\circ}$ C.	7.223	7.258	7.419	7.308	7.699	7.690
2. Thermometer in $1/10^{\circ}$ C.	7.206	7.290	7.420	7.315	7.649	7.619
3. Using water value from combustion results	7.314	7.350	7.512	7.394	7.800	..

The mean values with the different thermometers show fairly close agreement, and indicate that perfectly serviceable results may be obtained with the help of an accurately made thermometer reading directly to tenths, where a high degree of accuracy is not required. The results in the third line of the table are all higher, and approach more closely those obtained by the bomb. The first series only is included in the final statement of the comparative values.

The Bomb Calorimeter.—For the determination of the calorific values by combustion in oxygen under pressure, the modification designed by Langbein and Hugershoff was used in conjunction with the Stohmann calorimeter; both of these are fully described by Langbein (*Zeits. angew. Chem.*, 1900, 1236). This bomb resembles the well-known Mahler form; the chief difference, apart from certain mechanical alterations which facilitate the manipulation, is the lining of platinum foil in place of enamel. The ignition of the substance is effected by means of a short piece of sewing cotton, which is fixed to a fine platinum wire connecting the two pole pieces; the thread may either be tied round the pellet or simply allowed to rest in contact

with the coal. On making the current the platinum wire fuses and ignites the thread, which falls on to the coal and ignites the latter. The use of iron wire is inadvisable, on account of the danger of perforation of the platinum lining by fused particles of iron oxide.

A thermometer of the Beckmann type standardised by the Physikalische Reichsanstalt was used; the corrections were given to the nearest 0.001° C.

The Cooling Correction.—The accurate methods of correcting for loss of heat proposed by Berthelot, and by Regnault and Pfundler, as modified by Stohmann, are much too complicated for technical work. Langbein (*loc. cit.*) applied the formula $\Sigma \Delta t = n v' + \frac{v + v'}{2}$, in which n is the number of minutes which elapse after ignition before the maximum temperature is indicated, and v and v' respectively the average differences of temperature per minute before ignition and after the maximum has been reached. This correction is obviously too high; if we suppose the temperature to be constant before the combustion, i.e., $v = 0$, the correction then becomes $n v' + \frac{v'}{2}$; and this value is greater than that of the loss of heat which the

apparatus would suffer if the temperature were at the maximum for the whole duration of the combustion. In calculating the cooling correction we made use of the formula $\Sigma \Delta t = (n-1) \theta' + \frac{\theta + \theta'}{2}$, which gives a result sufficiently near the truth for all practical purposes. The figures given below may be taken to represent a typical case. A glance at these will show that, although the highest temperature was not reached till the third minute after ignition, the temperature at the end of the first minute did not fall much short of the maximum. In supposing the heat loss during the second and third minutes to be the same as that observed per minute after the combustion, and taking the correction for the first minute to be the mean of the heat changes before and after the combustion, no serious error is committed.

Corrections were also applied for the nitric and sulphuric acids formed in the combustion. In all cases 10 c.c. of water were placed in the bomb at the beginning of the experiment. The excess of heat developed by the sulphur over that obtained in practice, *viz.*, that due to the reaction $\text{SO}_2 + \text{O} + x \text{ aqua}$, is corrected for with sufficient accuracy, according to Langbein (*loc. cit.*), by deducting from the calorific value found 22.5 calories per 1 per cent. of S, if the amount of water is 10 c.c. For the estimation of the acids, the contents of the bomb were washed out, boiled to expel CO_2 , and titrated with 1/10 N $\text{Ba}(\text{OH})_2$, using phenolphthalein as an indicator. Excess of sodium carbonate solution containing 3.706 grms. per litre (1 c.c. neutralises an amount of HNO_3 in the formation of which 1 calorie is developed) was added to convert the barium nitrate into carbonate, the solution was filtered, and the excess of sodium carbonate titrated with 1/10 N HCl with addition of Methyl Orange.

The following results are given to illustrate the method:—

Weight of Coal used, 1.0058.

Temperature before Ignition.	During Combustion.	After Maximum.
0 min., 1.072	6 mins., 3.1	9 mins., 3.691
1 " 1.075	7 " 3.659	10 " 3.689
2 mins., 1.077	8 " 3.693	11 " 3.686
3 " 1.080		12 " 3.684
4 " 1.082		13 " 3.680
5 " 1.084		

$$v = -0.0024; v' = 0.0023; n = 3; \text{cooling correction} = 0.003.$$

Observed rise	2.609
Cooling correction	0.003
Thermometer correction	0.001
Corrected rise	2.615

In titration were used 13.6 c.c. of $\text{Ba}(\text{OH})_2$, 20 c.c. of Na_2CO_3 , and 5.4 c.c. of HCl .

Corrections for HNO_3 , 12: for S, 10 calories.	
Heat developed, $2,500 \times 2.615^\circ$	6,537.5 calories.
Correction for HNO_3 , 12 }	28.0 "
" " fuse, 16 }	
Heat evolved by 1.0058 grms. of coal	6,509.5 "
Heat of combustion per grm. = $\frac{6509.5}{1.0058}$	6,473 "
Correction for S (0.79 per cent.)	19 "
Calorific value	6,453 "

The water value of the apparatus was calculated from the results of the combustion of pure naphthalene (9692), phthalic anhydride (5300), salicylic acid (5269) and cane sugar (3955), using the values given in brackets. The mean of a number of closely agreeing results was adopted. The corrections in 40 estimations had the following extreme values:—Cooling correction, 0° to 0.015° C. ; mean, 0.005° C. ; HNO_3 correction, 10 to 18 calories; mean, 15.

The value of the sulphur correction depends on the quantity of that element present in the coal (22.5 calories

per 1 per cent. S), and in the case of coals rich in sulphur the omission of this correction may involve a considerable error. For technical purposes an average value for the nitric acid correction might be adopted, but there is no advantage in omitting the titration of the contents of the bomb, as the estimation of the sulphur, which is usually necessary, is most easily effected in this way.

The difference between the extreme values obtained for the individual coals varied from 0.06 to 0.7 per cent., the average for the 12 series being 0.35 per cent.

Discussion of Results.—The values directly obtained with the Lewis Thompson instrument neglecting the unburnt carbon are much too low. The deficit varies, with the coals investigated, from 1 to 13 per cent., and, generally speaking, may be said to increase with the carbon content of the coal. As has been already shown by Thomas, the results obtained with anthracite coals are absolutely unreliable. Scheurer-Kestner, in a series of determinations with twelve coals, found the 10 per cent. correction to be too small, and suggested an increase to 15 per cent. The present experiments confirm the first conclusion, but it is evident from a glance at the figures that it is not possible to arrive at accurate values by applying any constant correction. By taking account of the carbon which escapes combustion, results nearer the truth may be obtained. As a mean of two experiments with coals II., XI., and XII., the values 6521, 7755, and 7691 were obtained, assuming the substance which remained unburnt to be carbon having a calorific value 8140. These numbers agree very much better with the bomb results 6429, 7801, and 7912 in the two last cases: the value for coal II. is higher than that obtained by the bomb. The estimation of the unburnt carbon involves a considerable expenditure of time, and the results arrived at by applying this correction are still unreliable: Brame and Cowan (*loc. cit.*) find in the case of coal B a difference of 6.2 per cent. At best the method may be taken to give a very rough indication of the heating values of bituminous coals. The directly determined numbers in such a case may deviate from the absolute heating values by as much as 8 per cent.

The Wm. Thomson Calorimeter.—The chief difficulty in operating with this instrument consists in regulating the current of oxygen so as to avoid loss of heat through imperfect cooling of the products, and at the same time to ensure that the combustion shall be as complete as possible. The rate of flow of the oxygen should be adjusted so as to reduce to a minimum the formation of smoke which is always observed at the beginning of the operation; and the tube should be kept well up in the glass bell till the volatile matter has been burned, as recommended by Thomson. The figures obtained with the 12 coals examined are from 0.7 to 2.9 per cent. lower than those determined by the bomb, the mean deficit being 1.8 per cent. Our experience of the method is more favourable than that of Brame and Cowan, who found differences with 5 coals of 1.8 per cent. (coal E) to 6.9 per cent. (coal B), mean 3.6 per cent. The use of the coal in the form of compressed pellets, which ensures more uniform combustion, probably explains this result to some extent, and this mode of operating is certainly to be recommended. In using this method we suggest that the constants of the apparatus should be determined from the combustion of a sample of coal of average composition and of known calorific value. In the present series of experiments one of the coals was chosen at random for this purpose. The results agree very well with those obtained by the bomb; only in one case—coal 10—is there any considerable difference, and here also the error has been reduced by the use of this water value in place of that calculated from the weights and specific heats of the materials. From the results of our experiments we conclude that numbers sufficiently accurate for most practical purposes may be obtained from the Wm. Thomson calorimeter by careful attention to the regulation of the oxygen supply. The determination of the water value of the apparatus by the combustion of a sample of coal in the calorimeter may be objected to on the ground that the amount of unburnt gases varies with different coals; but it should be recognised that the method is only an approximate one, and that absolutely reliable results can only be obtained by the use of some form of bomb calorimeter.

Analysis of Coals.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
C	62.55	63.50	68.64	69.50	72.14	73.77	74.90	74.57	77.00	76.71	78.80	85.70
H	5.87	4.23	4.33	4.42	4.40	4.55	4.66	4.74	4.51	4.67	4.92	2.97
S	1.02	0.87	1.33	0.67	0.61	0.41	0.55	0.47	0.78	0.73	0.50	0.62
H ₂ O	8.63	7.92	8.96	9.28	8.34	7.99	7.21	6.95	2.31	1.94	2.72	3.15
Ash	11.78	10.15	6.90	5.97	4.22	1.76	2.68	1.37	7.17	8.49	4.18	3.59
O + N	11.55	11.53	9.84	10.16	10.29	11.52	9.91	11.90	8.23	7.46	8.88	3.97
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Coke	61.74	61.06	57.53	59.12	58.47	56.83	56.59	56.84	74.61	72.32	66.43	92.03
Fixed carbon	49.96	50.92	50.63	53.15	54.25	55.17	53.91	55.47	67.44	63.83	62.25	88.44

Calorific Values to Liquid Water.

Bomb	6,133	6,439	6,708	6,792	7,099	7,270	7,340	7,392	7,509	7,527	7,801	7,912
Calculated	6,007	6,354	6,731	6,804	7,003	7,182	7,341	7,446	7,530	7,592	7,785	7,887
Wm. Thomson	5,989	6,362	6,692	6,658	6,965	7,134	7,223	7,288	7,419	7,308	7,699	7,700
Lewis Thompson	5,945	6,380	6,560	6,520	6,775	6,958	6,790	6,940	6,890	6,910	7,255	6,880

Differences from Bomb Results per Cent.

Calculated	-2.0	-1.3	+0.3	+0.2	-1.3	-1.9	+0.0	-2.9	+0.3	+0.9	-0.2	-0.3
Wm. Thomson	-2.3	-1.3	-0.7	-2.0	-1.9	-1.9	-1.4	-1.4	-1.2	-2.9	-1.3	-2.7
Lewis Thompson	-3.1	-0.9	-2.2	-4.0	-4.6	-4.3	-7.5	-6.1	-8.4	-8.2	-7.0	-13.0

Wm. Thomson's Values, using Water Equivalent calculated from Results of Combustion of Coal.

Calorific values	6,065	6,432	6,739	6,742	7,053	7,224	7,314	7,380	7,512	7,394	7,800	..
Difference from bomb per cent.	-1.1	-0.1	+0.5	-0.7	-0.6	-0.6	-0.3	-0.2	+0.04	-1.8	0.0	..

$$\text{Formula for calculated values C.V.} = \frac{1}{100} \left[8,140 C + 34,500 \left(H - \frac{(O + N) - 1}{8} \right) + 2,220 S \right].$$

1. Splint coal, Lochgelly, Fife.
2. Boiler fuel (a mixture), Fife.
3. Ell coal, Bothwell.
4. Main coal, Bothwell.

5. Pyotshaw coal, Bothwell.
6. Dumfermline splint, Cowdenbeath, Pit 10.
7. Splint coal, Bothwell.
8. Dumfermline splint, Cowdenbeath, Pit 7.

9. Boiler fuel, Aitken Pit, Kelyt.
10. Haughrigg coking coal, Kilsyth.
11. Coking coal, Kilsyth.
12. Anthracite, Kilsyth.

Calculation of Calorific Values from the Results of Ultimate Analyses.—Before referring to the figures in the above table we will consider the possible differences in the values calculated by means of the modified Dulong formula which may result from errors in analysis. From the example which follows it will be evident that differences of ± 50 calories are well within the limits of experimental error:—

show differences of -3.7 to $+2.0$ per cent. A full discussion of this subject lies outside the scope of the present paper; but it is evident that the method of calculation from analytical results only gives approximate values, and that it should only be employed in cases where a direct determination is not possible.

	I.	II.
C	77.20	77.00
H	4.56	4.51
S	0.78	0.78
H ₂ O	2.41	2.31
Ash	7.20	7.17
O + N by difference	7.85	8.23
Calculated calorific value	7577	7530

The differences between the calculated and bomb values vary in our tests from $+65$ to -146 ($+0.9$ to -2.0 per cent.), and are distinctly greater than the possible experimental error in three cases only. Considering that the values for free carbon and hydrogen are used in the formula, and that the oxygen is assumed to be present as water—which is certainly not the case—the close agreement between the calculated and directly determined values is surprising. A further comparison of the figures in the table shows that the calculated values approach more closely to the bomb results than those obtained by the William Thomson calorimeter, but that they are, taken as a whole, rather less accurate than the William Thomson values based on the water equivalent determined by the combustion of coal.

Brame and Cowan find differences in five coals of -0.7 to -4.8 per cent. To the summary of previous work given by these authors may be added the results of the experiments of Bunte (Schilling's J., 1901, 34, 31), which

Obituary.

CAPT. H. C. ASPINWALL.

Capt. HENRY CHAPPELL ASPINWALL was born on Nov. 19, 1855, at Epsom, Surrey, and died June 28, 1904, at the Post-Graduate Hospital, New York City. He was general superintendent of the smokeless powder department of the Dupont Powder Co., residing at Haskell, N.J., and was unmarried. He was educated partly in England and partly in America. In 1879 he entered the Twenty-Second Regiment of New York State, and subsequently joined the Twelfth Regiment, leaving the service in 1893 with the rank of captain. During his career he devoted his studies to the improvement of explosives for military purposes, and was well known as a smokeless powder expert. He was a member of the American Chemical Society and the Society of Chemical Industry, and at his death was Vice-President of the New York Section of the Verein Deutscher Chemiker.

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I.—PLANT, APPARATUS, AND MACHINERY.

ENGLISH PATENTS.

Filters. G. Lebedinsky, Kieff, Russia. Eng. Pat. 16,760, July 30, 1903.

A HORIZONTAL, double-walled sieve drum, with corrugated outer surface, is mounted in a casing and is filled to a certain height only with granular filtering material such as sand or porcelain beads, &c. The fluid to be filtered flows from the outside to the inside, but for washing, the water flows in the opposite direction. During the washing operation the sieve drum is rotated, so that the filtering material may be shaken about and be thoroughly cleansed.

—W. H. C.

Filtering Apparatus. J. Wetter, London. From E. Boellinghaus, Hamburg. Eng. Pat. 27,287, Dec. 12, 1903.

A NUMBER of superposed filtering chambers are connected with the liquid supply-, discharge-, and rinsing-canals, situated in a tube common to all, by means of openings controlled by annular slides. Each chamber may act independently, and the filtration may take place, and the filtering medium be washed, in either an upward or downward direction, as desired.—W. H. C.

UNITED STATES PATENTS.

Drying-kiln. F. Meyer, Assignor to E. J. Kirby and the Chicago American Fuel Briquetting Co., all of Chicago. U.S. Pat. 761,088, May 31, 1904.

THE material to be dried is passed through the drying-chamber by a horizontal conveyer consisting of a number of open buckets, and is agitated by blades fixed to rotating shafts placed transversely across the conveyer. Hot air is admitted to the chamber, and suitable means are provided for rotating the shafts.—L. F. G.

Drying Powders; Apparatus for —. H. Croizier, Paris. U.S. Pat. 761,763, June 7, 1904.

SEE Eng. Pat. 18,661 of 1901; this J., 1902, 1178.—T. F. B.

Still. F. B. Merrill, Jonespoint, New York, Assignor to Merrill Process Co., New York. U.S. Pat. 761,315, May 31, 1904.

THE still is horizontal, and of egg-shaped cross-section, the wider part being at the bottom; and is provided with

a pendent swinging agitator, fixed to a horizontal axis near the top of the still.—L. F. G.

Calcining Apparatus. D. L. Kibler, Acme, Texas. U.S. Pat. 761,684, June 7, 1904.

A SEMI-CYLINDRICAL, horizontal shell or kettle, situated in a furnace, has flues traversing it. An oscillating agitator is arranged in the shell to keep both the flues and shell free from deposit.—W. H. C.

Muffle Roasting-Furnace. F. Meyers, New York. U.S. Pat. 761,691, June 7, 1904.

A SERIES of vertical furnaces, each consisting of a metal shell with refractory lining and superposed hearths, similar to the Herreshof furnaces, are connected together. A heating furnace is common to the series, and suitable flues are provided for conveying the hot gases through the series to the stack.—W. H. C.

Extracting Apparatus. H. J. P. Hampton, Albany, New York. U.S. Pat. 761,828, June 7, 1904.

THE combination is claimed, in the case of a steam-boiler, of a cylinder, pipe-connections between the steam and water space of said boiler and cylinder, a cup detachably secured to the lower end of the said cylinder, a strainer forming a bottom for the cup, and an agitator arranged within the cup.

—W. H. C.

FRENCH PATENTS.

Vapour from a Liquefied Gas such as Ammonia or Methylamine, &c.; Production of —. J. B. Fournier. Fr. Pat. 338,706, April 11, 1903.

A RESERVOIR containing the ammonia or other liquid communicates with a tubular vaporiser by means of a piston, actuated by the pressure of the vapour and regulated by a spring.—W. H. C.

Crystals; Process for Obtaining Good, Chemically Pure —. V. Schütze. Fr. Pat. 339,896, Jan. 26, 1904.

THE liquid to be crystallized is made to flow slowly through a double-walled tube, whilst warm or cold water or other liquid is circulated through the annular space in an inverse direction. The liquid in the inner tube is slowly and progressively cooled, and pure regular crystals are deposited. Means are provided for watching the progress of the

operation, for regulating the temperature and flow of the cooling liquid, and for filling and emptying the apparatus.

—W. H. C.

Furnace; Rotary —. W. S. Rockwell. Fr. Pat. 339,768, Jan. 21, 1904.

SEE Eng. Pat. 1503 of 1904; this J., 1904, 443.—T. F. B.

II.—FUEL, GAS, AND LIGHT.

Combustion; Mechanism of —. H. B. Dixon. J. Gas Lighting, 1904, 86, 745—753.

THE author discusses the chemical processes in flames, the subject being treated under the following headings:—Bunsen's theory of discontinuous combustion; pressures produced in explosions; influence of aqueous vapour on combustions; rate of explosion in gases; photographic analysis of explosion flames; velocity of a sound-wave in the flame of exploded gases; initiation of the explosion-wave.—A. S.

Prussian Blue in Spent Oxide, &c.; Determination of — by Feld's Method. R. Witzack. XXIII., page 728.

ENGLISH PATENTS.

Distillers' Refuse, Sewage, or the like; Treatment of — [Fuel Briquettes]. L. Cameron. Eng. Pat. 14,536, June 30, 1903. XVIII. B., page 724.

Briquettes for Fuel; Manufacture of —. H. H. Lake, London. From A. Petit and Co., Verviers, Belgium. Eng. Pat. 16,908, Aug. 1, 1903.

SEE Fr. Pat. 334,301 of 1903; this J., 1904, 54.—T. F. B.

Ovens for the Manufacture of Ovoid or other Shape Smokeless Briquettes. J. W. Mackenzie, London. From La Comp. des Charbons et Briquettes de Blanzay et de l'Ouest, Nantes, France. Eng. Pat. 9483, April 25, 1904.

THE ovens have a number of openings running longitudinally entirely through the partitions between them. These openings increase in size from the central partition to the end walls, and are placed in zig-zag form to increase the draught and allow the vapours to escape easily.

—W. H. C.

Treating and Enriching Gas; Means and Apparatus for use in —. A. G. Brookes, London. From M. M. Makeever, Boston, Mass. Eng. Pat. 6540, March 17, 1904.

A CASING is divided by means of a horizontal partition into two chambers, each of which is divided by means of vertical partitions into several compartments which communicate with each other alternately at opposite ends, so that the gas, in flowing through the apparatus, must pursue a zig-zag course first in the lower and then in the upper compartments. The lower compartments, in which the carburetted liquid is maintained at a certain level by means of a suitable reservoir, are packed with wicks in rope form, made from hemp or the like; whilst the upper compartments, which serve to filter the carburetted gas, are packed with ropes made of wood-fibre and asbestos.—H. B.

Gas Generating or Gasogen Apparatus for Producing Poor Gas free from Tarry Matters. L. Boutilier, Paris. Eng. Pat. 9942, April 30, 1904. Under Internat. Conv., Aug. 14, 1903.

A SHORT "distilling retort," open at the top, extends up through the centre of the grate of the generator into the incandescent zone of fuel. The fuel supply to the generator is fed upwards through the retort, by means of a screw conveyor or otherwise, at such a rate that the fuel remains in the retort long enough for all the tarry matters to be driven off before the residue mingles with the incandescent fuel. The tarry matters are decomposed during their passage upwards through the hot zone. Steam and air are

introduced at the base of the generator, and the gases are led off at the top as usual.—H. B.

Gas Washers; Construction of —. O. Imray, London. From F. Burgemeister, Celles, Germany. Eng. Pat. 15,060, July 7, 1903.

SEE Fr. Pat. 333,726 of 1903; this J., 1903, 1342.—T. F. B.

Gas; Process for Making —. W. Kent, New York. Eng. Pat. 15,645, July 15, 1903.

SEE U.S. Pat. 735,272 of 1903; this J., 1903, 990.—T. F. B.

Feeding and Distributing of Material in Gas Producers, Furnaces, and the like; Apparatus for the Continuous —. C. W. Bildt, Stockholm. Eng. Pat. 9376, April 23, 1904.

THE invention relates to fuel-feeding devices in which a distributing disc rotates beneath the lower end of the feed hopper. To prevent the fuel (waste wood, bark, peat, &c.) from sticking or locking in the hopper, two or more upright pins of sufficient length are attached rigidly to the upper side of the disc, extending up into the lower part of the hopper.—H. B.

Incandescence Bodies for Electric Glow Lamps; Manufacture of —. C. D. Abel, London. From Siemens and Halske, Act.-Ges., Berlin. Eng. Pat. 26,776, Dec. 7, 1903.

SEE Fr. Pat. 337,608 of 1903; this J., 1904, 484.—T. F. B.

UNITED STATES PATENTS.

Coke-Oven. J. S. Maxwell, Cumberland, Md., U.S.A. U.S. Pat. 761,521, May 31, 1904.

AT either side of a long series of coke-ovens, are arranged a pair of coke-ovens with straight end walls, and straight front and rear walls, the roofs of the ovens being arched. Suitable tie-rods and beams brace the ovens together, a central vent is provided in each, and car-tracks are laid on the top of all the ovens.—L. F. G.

Coke-Oven. C. Schroter, Chicago. U.S. Pat. 761,789, June 7, 1904.

THE coking chambers are surrounded by heating flues, which also pass beneath the retorts. Means are provided for introducing gaseous fuel and air under pressure, and for isolating any retort.—W. H. C.

Coal Gas; Process of Manufacturing —. T. Settle and W. A. Padfield, Exeter, England. U.S. Pat. 762,495, June 14, 1904.

SEE Eng. Pat. 12,552 of 1902; this J., 1903, 783.—T. F. B.

FRENCH PATENTS.

Briquettes from Powdered Fuel; Manufacture of —. R. Middleton. Fr. Pat. 339,370, Jan. 6, 1904.

A STARCHY paste is obtained by adding the minimum amount of boiling water to cereals, old potatoes, or the like, and the paste is mixed while hot with coal tar or Stockholm tar. The product is incorporated with pulverised fuel, and the mixture is compressed into blocks.—H. B.

Fuel; Artificial — and its Manufacture. E. J. Hoffman and N. J. Clark. Fr. Pat. 339,859, Jan. 25, 1904.

SEE Eng. Pat. 1887 of 1904; this J., 1904, 483.—T. F. B.

Coal, Minerals and Similar Substances; Process and Apparatus for Drying —. F. Baum. Fr. Pat. 339,952, Jan. 27, 1904.

SEE Eng. Pat. 2485 of 1904; this J., 1904, 539.—T. F. B.

Illuminating and Heating Gas; Manufacture of —. Deutsche Continental Gas Ges. and J. Bueb. Fr. Pat. 339,534, Jan. 12, 1904.

VERTICAL retorts, the diameter of which increases gradually from top to bottom, are arranged within the furnace so that

they may be strongly heated over their whole exterior. Having been brought to a high temperature, they are filled almost completely from above with the coal to be carbonised, the heat being well maintained. Gas is given off rapidly from the fuel contiguous to the retort walls, and a layer of compact impermeable coke is formed immediately. The gas passes up through the comparatively cool central part of the coal to the gas exit at the top of the retort, being kept from contact with the hot walls by the crust of coke. Distillation gradually proceeds towards the centre. The coal dust which is produced is retained by the column of fuel through which the gas has to ascend. It is claimed that the formation of naphthalene is thus prevented, and that the tar is obtained as a fluid brown oil, containing little coal.—H. B.

Generator for Low-grade Gas. Lerouge, Fornas and Cie. Fr. Pat. 339,817, Jan. 22, 1904.

At the base of the column of fuel in the producer, steam alone is admitted; at the upper end, at the foot of a cylindrical charging hopper, air, or a mixture of air and steam, is admitted; whilst the gas generated is drawn off from an intermediate point. By this arrangement the tarry matters distilling from the fresh fuel are caused to pass down through the incandescent zone before reaching the outlet, whilst the steam entering the lower region of the fuel prevents clinkering, utilises the heat of the cinders, and forms water-gas with any carbon remaining unburnt in the latter.—H. B.

Calcium Carbide; Agglomerating — L. Leinss. Fr. Pat. 339,492, Jan. 11, 1904.

For mixture with 400 kilos. of calcium carbide, 100 kilos. of molasses, containing about half its weight of sugar, is deprived of water as far as possible by heating to about 100° C., a small proportion of potassium permanganate is added with agitation, then 5 kilos. of dry sodium carbonate, 2 kilos. of zinc oxide, and 1 kilo. of finely-powdered lime. The crushed calcium carbide is then worked into the mass, whilst the temperature is kept at not below 90° C. The agglomerated mass is then moulded under pressure, and the cakes are rolled. Many advantages are claimed for this mixture over calcium carbide by itself, especially in reference to the application to the production of acetylene gas.—E. S.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM AND MINERAL WAXES.

Indophenine Reaction. L. Storch. XXIII., page 730.

ENGLISH PATENTS.

Phenols of Coal Tar; Process for the Separation of the — from the Neutral Constituents of the Latter. E. Schulze and Chem. Fabr. Ladenburg, G. m. b. H., Ladenburg, Germany. Eng. Pat. 17,266, Aug. 8, 1903.

SEE Fr. Pat. 234,525 of 1903; this J., 1904, 55.—T. F. B.

Protective Coating [from Tar]; Non-inflammable Composition for use as a —. G. Mahieux, Asnières, France. Eng. Pat. 7068, March 23, 1904. Under Internat. Conv., March 26, 1903.

SEE Fr. Pat. 330,608 of 1903; this J., 1903, 1081.—T. F. B.

UNITED STATES PATENT.

Mineral and Rosin Oils; Process of Making Watery Solutions of —. F. Boleg, Eeslingen, Germany, Assignor to Ges. z. Verwertung der Bolegschen Wasserlöslichen Mineralöle und Kohlenwasserstoffe, Ges. m. beschr. H., Berlin. U.S. Pat. 761,939, June 7, 1904.

SEE Eng. Pat. 12,349 of 1899; this J., 1900, 526.—T. F. B.

FRENCH PATENT.

Peat Wax and Analogous Products; Manufacture of —. E. Bouchaud-Praceiq. Fr. Pat. 338,736, April 14, 1903.

PEAT, lignite, &c., are extracted with suitable volatile solvents, e.g., alcohol or ethylic esters, and the extract evaporated. The residual wax-like substance, which resembles beeswax, is hard and has a high melting point and a specific gravity above 1.000.—C. A. M.

IV.—COLOURING MATTERS AND DYE STUFFS.

Rosanilines; Polyacid Salts of —. J. Schmidlin. Comptes rend., 1904, 138, 1508—1510.

THE existence of triacid derivatives of rosanilines was asserted by Hofmann, who prepared brown substances to which he assigned that composition; but his analytical figures did not support the conclusion very strongly. The author finds that by placing these substances *in vacuo* over potassium hydroxide for a month they lose completely the excess of acid which they contain, and the brown mass becomes quite black and inodorous. The substances thus obtained are exceedingly stable, and their analysis gives figures agreeing exactly with the composition of trihydrochloride of rosaniline, pararosaniline, and hexamethylpararosaniline respectively. They dissolve in alcohol and in water with the same colour as the corresponding monacid salts, and the colouring properties are not lessened by the saturation of all the basic functions in the molecule. In the case of pararosaniline, Rosenstiehl obtained a tetrahydrochloride by saturating with hydrochloric acid gas and removing the excess by means of a current of air; but the author finds that the evolution of hydrochloric acid does not cease at this point, for the tetrahydrochloride still gives off the gas to the atmosphere. The substance saturated with hydrochloric acid gas at the ordinary temperature and pressure is red, and contains hydrochloric acid more than corresponding to a pentahydrochloride; but as the temperature is lowered more gas is absorbed, and the colour fades through orange and yellow, till in a bath of liquid air it is perfectly white.—J. T. D.

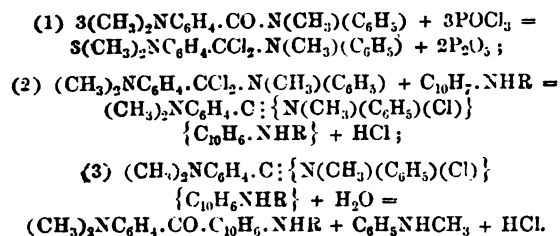
Triphenylmethane Series; Some Reactions in the —. E. Vongerichten and K. Weiling. Z. Farben- u. Textil-Chem., 1904, 3, 217—218.

WHEN *p*-triaminotriphenylmethane and *p*-triaminotriptylmethane are heated respectively with toluidine and aniline hydrochlorides, transformation occurs, toluidine being replaced by aniline, or *vice versa*. When *p*-diaminoditolylmethane and the corresponding diphenylmethane derivative are treated in a similar manner, however, Vongerichten and Bock (Z. Farben- u. Textil-Chem., 1903, 2, 249) have shown that the final product in either case is *p*-diaminophenyltolylmethane. The authors have now examined the behaviour of *p*-diaminotriphenylmethane, and find that when heated with a strong excess of *o*-toluidine hydrochloride and *o*-toluidine, it is converted into *p*-diaminoditolylmethane; and also that the latter when heated with aniline hydrochloride and aniline, is again converted into *p*-diaminatriphenylmethane.—A. S.

Naphthylidiphenylmethane, Dinaphthylphenylmethane, and Trinaphthylmethane Series; Dyestuffs of the —. E. Noelting. Ber., 1904, 37, 1899—1920.

THE author obtains dinaphthylphenylmethane dyestuffs by condensing dimethyl-*p*-aminobenzaldehyde and its nitro-derivatives with secondary alkylnaphthylamines and oxidising the leuco bases so obtained, and also by preparing diamino-naphthylphenylketones and condensing these with secondary α -naphthylamines. Naphthylidiphenylmethane dyestuffs were obtained by condensing the above-mentioned ketones with tertiary amines of the benzene series and dyestuffs and leuco bases of the trinaphthylmethane group by the action of carbon tetrachloride on secondary α -naphthylamines or their *o*-formic acid esters. The diamino-naphthylphenyl ketones were obtained by heating

secondary α -naphthylamines with dimethyl-*p*-aminobenzo-methylanilide and phosphorus oxychloride and hydrolysing the aurammonium compound so formed with alcoholic alkali hydrous or concentrated sulphuric acid according to the equations:—



These ketones are weakly basic and dye in yellow shades, but cannot be considered to be real dyestuffs. They are reduced by sodium amalgam in alcoholic solutions to the corresponding hydrols (carbinols) which dye silk and tannin-mordanted cotton in violet blue to green shades. On treating the aurammonium compounds with ammonia or the ketones with ammonium chloride and zinc chloride, Auramines are obtained, dyeing in yellowish-orange shades, which are more stable to acids than ordinary auramine but are readily converted by alkalis into the corresponding ketones. Dyestuffs of the dinaphthylphenylmethane and trinaphthylmethane series have no practical importance on account of their insolubility and relatively high cost of production. The replacement of one benzene nucleus by a naphthalene nucleus in Crystal Violet changes the shade to blue. On replacing the second and third benzene nuclei by naphthalene nuclei, the blue becomes greener at each step, but the difference in shade is not so marked as at the first stage. The presence of a nitro group in the benzene nucleus renders the shade of the dyestuff more violet. When naphthylidiphenylmethane dyestuffs are treated with acetic anhydride and sodium acetate, or acetic anhydride and a little sulphuric acid, the secondary aminonaphthyl group is acetylated and green dyestuffs are obtained, the solubility in water being considerably increased. The acetyl group is split off by acids or alkalis. The nitrosamine of Victoria Blue is known to be a green dyestuff. The author finds that the nitrosamines of the three other naphthylidiphenylmethane dyestuffs prepared by him are also green in shade. Thus the shade is changed to green on either acetylating or nitrosating a secondary amino group, and the relations are exactly analogous to those observed with Pentamethyl Violet. On acetylating dinaphthylmethane dyestuffs which contain two secondary amino groups with acetic anhydride and a little sulphuric acid, red diacetylated dyestuffs are formed. On acetylating with acetic anhydride and acetic acid, green mono-acetylated dyestuffs are obtained. Similar relations were also observed with the trinaphthylmethane dyestuffs. Both groups of dyestuffs also yield red dyestuffs with 2 mols., and green dyestuffs with 1 mol., of nitrous acid.—E. F.

Triphenylmethyl. M. Gomberg. Ber., 1904, **37**, 1626—1644. This J., 1903, 1343 and 621; also 1901, 33 and 114.

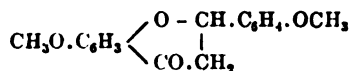
If a solution of tri-*p*-tolylcarbinol chloride, prepared from carbon tetrachloride and toluene with aluminium chloride in an inert solvent such as benzene, be treated with molecular silver in absence of air, the solution acquires an orange colour, and an unsaturated compound is formed. On remaining for some time in absence of air, the solution loses its colour, and hexatolyethane, $(\text{CH}_3\cdot\text{C}_6\text{H}_5)_2\text{C}:\text{C}:(\text{C}_6\text{H}_4\cdot\text{CH}_3)_2$, is formed by polymerisation of the tri-*p*-tolymethyl, which is presumably formed in the first instance. When tri-*p*-tolylcarbinol chloride is acted on by molecular silver, in presence of a current of air, in benzene solution, the orange-coloured substance is decolorised almost as fast as it is formed, and a crystalline deposit of a peroxide $(\text{CH}_3\text{C}_6\text{H}_5)_2\text{C}\cdot\text{O}\cdot\text{O}\cdot\text{C}(\text{C}_6\text{H}_5\cdot\text{CH}_3)_2$ is obtained. It can be separated from the carbinol and hexatolyethane by dissolving the latter substances in ether, and can then be recrystallised from benzene. The same peroxide

is obtained in fairly good yield by treating tri-*p*-tolylcarbinol chloride in benzene solution with an aqueous sodium peroxide solution in presence of a little acetic acid. The peroxide is readily hydrolysed by means of aceto-sulphuric acid to the corresponding carbinol, whilst with hydrochloric acid tri-*p*-tolylcarbinol chloride is regenerated. Di-*p*-tolylphenylcarbinol chloride was prepared from *p*-bromotoluene and methyl benzoate. Its behaviour towards metals is quite analogous to that of the tritolyl compound. By the action of air and molecular silver, 70–80 per cent. of the peroxide can be obtained. The solutions of di-*p*-tolylphenylmethyl are less red (more orange) in shade than those of tri-*p*-tolylmethyl. This peroxide can also be obtained by the action of sodium peroxide on the carbinol chloride. Diphenyl-*p*-tolylcarbinol chloride was found to be best prepared by the Friedel-Craft reaction from toluene and benzophenone dichloride. The latter substance reacts in this manner with exceptional ease, forming analogous derivatives with chloro-, bromo-, and iodo-benzene, naphthalene, &c., and substituted benzophenone dichlorides show a similar activity, so that the most diverse derivatives of triphenylcarbinol chloride may be conveniently prepared in this way. Diphenyl-*p*-tolylcarbinol chloride resembles in its action on metals the triphenyl compound rather than its higher homologues. With zinc it reacts energetically, forming a syrupy double salt and an unsaturated compound which absorbs iodine and is quickly oxidised in the air to a peroxide. A solution of the carbinol chloride treated with molecular silver acquires an orange yellow shade rather darker than that from the triphenyl- and less red than that from the di-*p*-tolyl-phenyl-compound. The peroxide was prepared by both methods used in the case of the two other tolyl-derivatives; *p*-chloro-, *p*-bromo-, and *p*-iodotriphenylcarbinol chlorides were obtained by the action of chloro-, bromo-, and iodobenzene on benzophenone dichloride in presence of aluminium chloride; *p*-chlorotriphenyl carbinol chloride was also prepared by the action of benzene on *p*-chlorobenzophenone chloride, and was identical with the substance obtained by the other method. All three *p*-halogen-substituted triphenylcarbinol chlorides behave towards metals in a manner analogous to the tolyl-compounds. With molecular silver the chloro-compounds yielded a wine-red, and the bromo- and iodo-compounds an orange-red coloration. On exposure to air these unsaturated compounds formed peroxides insoluble in ether. Tri-*p*-chlorotriphenylcarbinol chloride was obtained by the action of chlorobenzene on carbon tetrachloride. With molecular silver a benzene solution of this substance gives a Bordeaux Red coloration, finally changing to a Magenta violet which is so deep that a three per cent. solution is quite opaque. In presence of air the colour disappears and a powdery product can be isolated, probably the peroxide. Diphenyl- α -naphthyl carbinol chloride was obtained by the action in carbon bisulphide solution, of naphthalene on benzophenone dichloride in presence of aluminium chloride. With molecular silver in benzene solution it yields a deep brownish-yellow solution with green fluorescence. It is decolorised by the air with astonishing rapidity, and a crystalline peroxide is deposited. Trinaphthylcarbinol and its chloride were obtained by the action of naphthalene on carbon tetrachloride in presence of aluminium chloride, but could not be obtained in a colourless form, so their behaviour was not further studied. Tri-*p*-nitrotriphenylcarbinol chloride was obtained in an impure form from its carbinol, by the action of phosphorus oxychloride or pentachloride in nitrobenzene solution. The carbinol is not acted on by dry hydrochloric acid gas in benzene solution, nor by acetyl chloride. The carbinol chloride gives with molecular silver in benzene solution, on gentle warming, a blue green liquid, and on further warming, the colour changes to magenta violet. On cooling, the bluish-green coloration returns. On exposure to air the corresponding peroxide is formed. All the triphenylmethyl derivatives described above, with the possible exception of the tritolyl compound, absorb iodine, forming colourless compounds. As the faculty of forming peroxides disappears, for instance, by polymerisation on standing, the faculty of absorbing iodine disappears also, and the solutions become colourless. The author finds that triphenylmethyl exists in its solutions in a dimolecular

condition, but he considers this to be merely a case of association and formulates it as $(C_6H_5)_3C$ — and the peroxides as $R_3C.O.O.Cl_3$.—E. F.

2.2'-Dihydroxyflavonol; *Synthesis of* —. A. Katschalsowsky and St. v. Kostanecki. Ber., 1904, 37, 2346—2351.

ON condensing quinacetophenone monomethyl ether with *o*-methoxybenzaldehyde, 2.2'-dimethoxyflavanone—

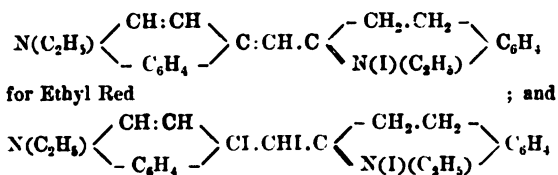


is produced. Isonitroso-2.2'-dimethoxyflavanone, obtained by treating this compound with amyl nitrite and hydrochloric acid, is converted by treatment with sulphuric acid into 2.2'-dimethoxyflavonol, which is demethylated by means of hydriodic acid, 2.2'-dihydroxyflavonol being formed. It dyes mordanted cotton much deeper shades than do 2.3'- or 2.4'-dihydroxyflavonol (see this J., 1904, 367). The mordant-dyeing properties of this compound show that those of Morin are due, not only to the chromogen

$\begin{matrix} C.OH \\ | \\ CO \end{matrix}$ group and to the hydroxyl group in the *peri* position to the keto group, but also to the *anchi*- (or 2') hydroxyl group.—T. F. B.

Cyanine Dye-stuffs; *Constitution of* —. A. Mieth and G. Book. Ber., 1904, 37, 2008—2022.

THE authors find that Ethyl Red, the dye-stuff obtained by the action of alkali hydroxide on a mixture of quinoline ethyl iodide and quinaldine ethyl iodide in alcoholic solution, has the formula $C_{22}H_{23}N_2I$. The best yield is obtained by using a mixture of 2 mols. of quinoline ethyl iodide with 1 mol. of quinaldine ethyl iodide. An alcoholic solution of quinoline ethyl iodide alone yields no dye-stuff with alkali hydroxide. Ethyl Red combines with 2 atoms of iodine to form a perfectly stable compound, soluble with difficulty in water and in alcohol, but readily soluble in acetone to a deep red solution. This addition compound possesses none of the properties of a periodide such as quinoline periodide. For instance, its solution in acetone shows no blue coloration with starch solution. From the above considerations the authors deduce the constitutional formula:—



for the iodo-addition product. By the action of alkali hydroxide in alcoholic solution on quinaldine ethyl iodide alone, a homologue, $C_{21}H_{22}N_2I$, of Ethyl Red is formed, which differs from the latter in shade and is a far less efficient sensitiser of a silver-bromide-gelatin plate. By the action of 1 mol. of silver nitrate, Ethyl Red is converted into the corresponding nitrate $C_{22}H_{23}N_2(NO_3)$ which is an excellent sensitiser for photographic plates, which it clouds far less than the original Ethyl Red, and has the further advantage of being very soluble in water and in alcohol. —E. F.

ENGLISH PATENTS.

Diazo Colouring Matters [Azo Dye-stuffs]; *Manufacture of* —. G. W. Johnson, London. From Kalle and Co., Biebrich-on-the-Rhine. Eng. Pat. 12,120, May 27, 1903. SEE Fr. Pat. 332,714 of 1903; this J., 1903, 1290.—T. F. B.

Azo Colouring Matters; *Manufacture of New* —, and of Intermediate Products for the Production of such Colouring Matters. H. E. Newton, London. From Farbenfabr. vorm. F. Bayer and Co., Elberfeld, Germany. Eng. Pat. 16,581, July 28, 1903.

SEE Fr. Pat. 334,140 of 1903; this J., 1904, 16.—T. F. B.

Anthraquinone Derivatives; *Manufacture of New* — [Nitroanthraquinonesulphonic Acids]. H. E. Newton, London. From Farbenfabr. vorm. F. Bayer and Co., Elberfeld, Germany. Eng. Pat. 17,565, Aug. 13, 1903. SEE Fr. Pat. 334,576 of 1903; this J., 1904, 57.—T. F. B.

Azo Dye-stuffs; *Manufacture of New* —, and of Products to be used in the said Manufacture. J. Y. Johnson, London. From The Badische Anilin u. Soda Fabrik, Ludwigshafen-on-the-Rhine, Germany. Eng. Pat. 16,995, Aug. 4, 1903.

THE new azo dye-stuffs are 2-hydroxy-1-azo derivatives of naphthalene, and are prepared from 2.4-dichloro-1-naphthylamine, by acetylating it, sulphonating, splitting off the acetyl group, diazotising the dichloronaphthylaminemono-sulphonic acid, and treating the diazo solution with a substance capable of neutralising the acid, e.g., sodium acetate or carbonate, chalk, magnesia, whereby one of the chlorine atoms is replaced by a hydroxyl group, and a hydroxy-chlorodiazonaphthalenesulphonic acid or its inner anhydride is produced. The latter, when coupled with β -naphthol, gives a dye-stuff which is soluble in water, and dyes wool in an acid bath brownish-violet shades, changing on treatment with potassium bichromate or a mixture of a chromate and a chromium salt, into a deep bluish-black, having a blue "overhand" appearance, and very fast to washing, milling, "potting," and light. Other hydroxy derivatives of naphthalene, e.g., the 2.7- or 1.5-dihydroxynaphthalenes may be substituted for the β -naphthol.—A. S.

UNITED STATES PATENTS.

Orange Sulphur Dye [Sulphide Dye-stuff]. W. Emmerich. Assignor to Farb. vorm. Meister, Lucius and Brünig, Hoechst-on-the-Maine, Germany. U.S. Pat. 760,110, May 17, 1904.

"TOLUYLENE-DIUREA" is heated with sulphur. The product is a dark reddish-brown powder, soluble in sodium hydroxide solution and in sodium sulphide solution with a brown colour. On evaporating the sodium sulphide solution the dye-stuff is obtained in a form soluble in water. the solution dyeing cotton in fast, bright, orange shades. —E. F.

Azo Dye-stuffs; *Preparation of* —. W. Loeb, Bonn. Assignor to C. F. Boehringer und Soehne, Mannheim-Waldhof, Germany. U.S. Pat. 761,310, May 31, 1904.

A MIXTURE of an aromatic amine, potassium nitrite, and an acid "coupling compound," or one of its salts, is submitted, in aqueous solution, to the anode action of an electric current. For example, "Ponceau 2 G." is prepared by electrolysis a mixture of 10 parts of aniline, 9.1 parts of potassium nitrite, 32.7 parts of β -naphtholdisulphonic acid, and 100 parts of water, using a platinum cathode. —T. F. B.

Indoxyl, &c.; *Process of making* —. A. Bieschler, Assignor to Basle Chemical Works, Basle, Switzerland. U.S. Pat. 761,440, May 31, 1904.

INDOXYL, its homologues and their derivatives are produced by melting the alkali salt of the corresponding aryl glycin compound with alkali hydroxide, an alkali metal, and a small quantity of the product obtained by dissolving sodium in alcoholic potash, and distilling off the alcohol. An alkali sulphite may also be added to the mixture. —T. F. B.

FRENCH PATENTS.

Dye-stuff obtained from Asphodel Roots. A. Badoil and J. E. Valadon. Fr. Pat. 333,478, Nov. 28, 1903.

THE material is washed, divided, and extracted with water at a temperature of 30°–60° C. The extract is fermented and used for spirit manufacture. A resin is then extracted from the residue by boiling with water in contact with the air. This resin decomposes under these conditions, and a dye-stuff solution is formed of a bright reddish-black shade which changes to pure black under the action of ferrous sulphate and other mordants. The residual fibre is used for paper-making.—E. F.

Lakes [from Azo Dyestuffs]; Process for Preparing New —. Soc. Anon. Prod. F. Bayer et Cie. Fr. Pat. 339,606, Jan. 14, 1904.

RED lakes, fast to light, are obtained by precipitating on a suitable substratum the dyestuff obtained by coupling diazotised anthranilic acid with α -naphthol sulphonic acids (e.g., naphthol sulphonic acids 1.3, 1.3.6, 1.3.8, &c.).
—T. F. B.

Azo Dyestuff and Lakes derived from it; Production of New —. F. Bayer et Cie. Fr. Pat. 339,947, Jan. 27, 1904.

THE sodium salt of *m*-aminobenzoic acid is diazotised and combined with 2-naphthol-3.6.8-trisulphonic acid. The colour is precipitated with salt, and dyes wool from an acid bath in orange shades. The colour lake which is prepared by precipitation with a salt of calcium, barium, strontium or aluminium, &c. in the usual way, is fast to light.
—A. B. S.

V.—PREPARING, BLEACHING, DYEING, PRINTING AND FINISHING TEXTILES, YARNS, AND FIBRES.

Silk-Cocoon; Destruction of the Chrysalis of the — by the Action of Cold. J. de Loverdo. Comptes rend., 1904, 138, 1434—1436.

THE destruction of the chrysalis may be effected as certainly by exposure to cold as by the hot process. The cocoons are allowed to remain for about a month in a dry atmosphere maintained at a constant temperature below 0° C. The action of temperatures between 0° and -8° C. is practically the same, but the lower temperatures are always preferable. The cocoons can be placed in the cold chamber as soon as they are ready, and require no attention, as in the case of hot stoving, and the waste which occurs with the old methods is avoided.—J. F. B.

ENGLISH PATENTS.

Felted or Matted Goods or Fabrics; Manufacture of — from Fibres or Fibrous Materials. J. Y. Johnson, London. From G. Goldman, Baltimore, U.S.A. Eng. Pats. 2680; 2681; 2692; 2683; and 2684; Feb. 3, 1904.

SEE U.S. Pats. 758,243; 758,245; 758,246; 758,244; and 758,247 of 1904; this J., 1904, 544.—T. F. B.

Milling or Fulling and Washing and Scouring Textile Piece Goods; Machines for —. T. Lumb, T. Wallshaw, and D. White, Morley, England. Eng. Pat. 12,342, May 30, 1903.

THE pressure of the upper squeezing roller is regulated, according to the cloth under treatment, by means of levers and adjustable weights. A pair of vertical corrugated rollers are placed between the "draught board" and the squeezing rollers; these serve to break up longitudinal creases in the cloth. The draught board is connected by levers with a clutch on the driving pulley, and if a knot in the fabric prevents it passing freely through the openings in the draught board, the latter is moved and throws the driving pulley out of gear and thus stops the machine. After leaving the squeezing rollers, the cloth is again opened out by an arrangement of "rams" which works transversely. When used as a milling machine, the hinged floor is held up to form a trough under the squeezing rollers; for use as a scouring machine the hinged floor hangs at right angles, so that the piece can travel round in an endless band.—A. B. S.

Indigo-dyed Woollen Goods; Process for Increasing the Fastness to Wear of —. O. Imray, London. From F. Peterhauser, Höchst-on-the-Maine, and F. Rechburg, Hersfeld, Germany. Eng. Pat. 14,840, July 3, 1903.

THE wool is mordanted with metallic salts, such as potassium bichromate, before dyeing with indigo.—A. B. S.

Designs Impressed on Fabrics; Method of Fixing or Protecting —. L. J. Chischin, Moscow. Eng. Pat. 18,599, Aug. 28, 1903.

SEE Fr. Pat. 335,238 of 1903; this J., 1904, 115.—T. F. B.

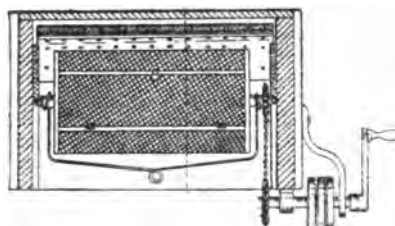
Soap for Dyeing and Cleaning; Manufacture of —. A. J. Boulton, London. From C. W. Horton, Cleveland, U.S.A. Eng. Pat. 28,508, Dec. 28, 1903. ✓

A MIXTURE of water and a coal tar dyestuff is incorporated with the soap while still in a plastic condition.—C. A. M.

UNITED STATES PATENTS.

Dyeing; Machine for —. C. W. Herbine and H. Rech, Reading, Pa., U.S.A. U.S. Pat. 760,118, May 17, 1904.

A MACHINE for dyeing hosiery or yarn, comprising a tank with a curved bottom, a perforated false bottom, a removable perforated cylinder revolving in guide-bearings in either



end of the tank, with a handle for lifting the cylinder, and machinery for revolving it.—E. F.

Wool-Fat; Process of Recovering —. C. E. Swett, Assignor to R. H. Hutchinson. U.S. Pat. 761,265, May 31, 1904. XII., page 719.

FRENCH PATENTS.

Dyeing, Bleaching, &c., Yarns; Method of and Apparatus for —. W. Reid. Fr. Pat. 339,322, Jan. 2, 1904.

YARNS are spirally wound upon two reels fitted into a frame, which is capable of being revolved while it is moved along above, or is immersed in a dye- or other bath. Springs or other devices are employed to maintain the yarns—e.g., wool yarns—under a constant degree of tension, while allowing them to contract, during any of the operations to which they are subjected. Two grooved shafts, placed on opposite sides of the dye- or other tank, cause a number of the frames successively first to advance some distance, and then to return almost the same distance, until the carriage which conveys them has reached the ends of the shafts, when the movement is reversed, and the frames are caused to return in the same manner. The reels may be made flat to facilitate their passage, in the frames with the yarns upon them, between squeezing rollers, for the purpose of removing the excess of liquor from the yarns, or they may be hollow and perforated, to admit of the introduction of a closed steam pipe into them for drying purposes. Arrangements for simultaneously raising or lowering a number of frames out of or into a dye, &c. tank, are also claimed.
—E. B.

Textiles in Hanks; Machine for Mechanically Dyeing —. E. Dittmar. Third addition, dated Jan. 11, 1904, to Fr. Pat. 315,658, Nov. 6, 1901.

THE rods which carry the hanks (see this J., 1902, 547, and 1903, 416) are made of bamboo or rice-cane.—T. F. B.

Dyeing with Aniline Dyestuffs; Solid Compound for —. G. Rowland. Fr. Pat. 339,869, Jan. 25, 1904.

SEE Eng. Pat. 1502 of 1904; this J., 1904, 543.—T. F. B.

Dyeing and Bleaching of Cotton in Bobbins; Machine for —. Soc. Schwab. Frères and A. Wioland. Fr. Pat. 339,946, Jan. 27, 1904.

THE bobbins are arranged side by side in a closed vessel. The spaces between the bobbins are filled by means of

diaphragms, so that no liquid can pass, except through the substance of the bobbins. The closed vessel is exhausted by an air pump, and then the dyeing or bleaching liquid is run in and circulated continuously by means of a pump. The dye vessel can be heated if desired by a steam pipe.

—A. B. S.

Rice Flour; Treatment of — for use in Finishing Yarns and Textiles. Soc. anon. des Rizeries Françaises. Addition to Fr. Pat. 334,369, Aug. 1, 1903. XIX., page 725.

VII.—ACIDS, ALKALIS, AND SALTS.

Alkali Carbonate and Calcium Carbonate; Decomposition of Mixtures of —, at High Temperature in vacuo. P. Lebeau. Comptes rend. 1904, 138, 1496—1498.

THE dissociation of alkali carbonates, which occurs when they are heated in vacuo (this J., 1904, 60) is facilitated by admixture with calcium carbonate. Complete dissociation of the carbonates of cesium, rubidium, potassium, and sodium, occurs under these circumstances at 1000° C. This temperature is above that at which calcium carbonate alone dissociates, and the dissociation pressure throughout is lower than that of calcium carbonate at the same temperatures, suggesting the existence of double carbonates of the alkali metal and calcium. The residue after complete dissociation consists of pure lime (the alkali metal oxide having volatilised) in irregularly shaped transparent fragments, without action or polarised light, much less readily attacked by reagents than that obtained by simple calcination of the carbonate. Mixtures of lithium and calcium carbonates give a different result, the residue always containing lithia as well as lime.—J. T. D.

Barium Sulphate of the Lozère District. Guédras. Comptes rend., 1904, 138, 1440.

THE most distinctly crystalline deposits of barytes in the Lozère district are found near Altier, arrondissement de Mende. The mineral is very rich in copper, containing up to 10 per cent. of that metal, and also contains considerable quantities of tin. The vein is a very thin one. In the commune of Villefort there is a vein of barytes charged with galena; this barytes occurs in form resembling chalk. A portion of this vein is poor in galena and assumes a very definite form; the cleavages are perfect and show a vitreous, pearly lustre, which is lacking in the other barytes of the district; this lustre contributes largely to its industrial value. In both these deposits the embedding rock is composed of silky schists, stained with malachite in contact with the vein of barytes.—J. F. B.

Basic Ferric Phosphite. E. Berger. Comptes rend., 1904, 138, 1500—1501.

FRESHLY precipitated ferric hydroxide dissolves in phosphorous acid, but the solution is decomposed completely by water in sufficient excess, giving a white precipitate. This precipitate, washed with water, slowly gives up phosphorous acid, and the residue when no more phosphorous acid can be washed out, dried first on a porous plate, and finally in vacuo over sulphuric acid, has a perfectly fixed composition. The results of analysis, and the reducing action of the salt on permanganate prove that no ferrous salt is present, and that the substance is basic ferric phosphite, $(\text{PO}_3\text{H})_2\text{Fe}_2$, $\text{Fe}(\text{OH})_3 \cdot 5\text{H}_2\text{O}$.—J. T. D.

ENGLISH PATENTS.

Sulphuric Anhydride; Manufacture of —. W. P. Thompson, London. From G. Wischin, Munich, Germany. Eng. Pat. 12,419, May 30, 1903.

THE mixture of sulphur dioxide and air or oxygen is led through an annular section containing contact material, the outside of which section is exposed to a cooling atmosphere, and then consecutively through a similarly packed wider annular section, enveloped by the first section, with or without the interposition of a comparatively narrow intervening space. No external source of heat is used, except that the gases are admitted in a hot state. Several forms of

apparatus are described, but in all, the first, relatively narrow annular section (in which the reaction is most vigorous) serves as a heating jacket to the wider, interior annular section or sections.—E. S.

Sulphuric Acid; Manufacturing —. H. H. Nidenführ, Berlin. Eng. Pat. 1066, Jan. 15, 1904.

THE gaseous sulphurous acid used in the chamber process of manufacturing sulphuric acid is cooled before entering the chamber by being utilised in concentrating the chamber acid, or by special cooling devices, and is purified, especially from arsenic, &c., by passage through washers, filters, or the like. The denitration is effected by the action of cooled sulphurous acid gases. A pressure generator is arranged before a special denitrating device, and between that and the part of the plant in which the acid is concentrated, in order to increase the relative efficiency of the denitrator and "of the nitric acid in the chamber, and for decreasing the quantity of nitric acid necessary for carrying on the reaction."—E. S.

Cyanides; Manufacture of —. J. Tcherniac, Freiburg, Germany. Eng. Pat. 17,449, Aug. 11, 1903.

IN manufacturing cyanides by oxidising a thiocyanate (sulphocyanide) by nitric acid, &c., as directed in Eng. Pat. 17,976 of 1902 (this J., 1903, 1045), it is now directed to pass the washed gaseous mixture, containing hydrogen cyanide and nitric acid vapour, over a salt or oxide (such as anhydrous sodium sulphate or alumina) which reacts or combines with nitric acid, but has little or no effect on hydrogen cyanide. The absorption of the hydrogen cyanide is effected by an alkali hydroxide heated to a temperature below its melting point, but above that at which the water generated by the reaction is completely vaporised. In using caustic soda for this purpose, it is first heated to about 200° C., and finally to about 300° C.—E. S.

Glauber Salts and Ferrous Sulphate; Production of —, from Nitre-cake or Acid-sodium-sulphate. C. L. Parker, London. Eng. Pat. 9619, April 27, 1904.

IRON, or iron oxide, or spathic iron ore, is added in excess to solution of nitre-cake (acid sodium sulphate) of sp. gr. 1.275—1.300. Glauber's salt is crystallised out of the settled and cleared solution, and the mother liquid is concentrated to obtain crystalline ferrous sulphate. The process may be modified by neutralising the acid liquor by the iron or the like, at two stages of the operation. Reference is made to Eng. Pat. 24,639 of 1903; this J., 1904, 252.—E. S.

FRENCH PATENTS.

Ammonium Nitrate; Process for Extracting — from Sodium Nitrate and Ammonium Sulphate. E. Naumann. Fr. Pat. 339,733, Jan. 20, 1904.

A MIXTURE of solutions of sodium nitrate and of ammonium sulphate is boiled, and the sodium sulphate which salts out is removed. At a certain stage of the process the solution is cooled sufficiently to become saturated with ammonium nitrate; a double salt containing ammonium sulphate then separates, and the mother-liquor, after concentration if desired, is rapidly cooled in a prescribed manner, not subject to external disturbance, to obtain a deposition of ammonium nitrate, which may be refined.—E. S.

Zinc Sulphide and other Sulphides; Process of Extracting —. G. D. Delprat. Fr. Pat. 339,920, Jan. 26, 1904.

SEE Eng. Pat. 27,132 of 1903; this J., 1904, 610.—T. F. B.

Sodium Ferrocyanide; Manufacture of —. Administration des Mines de Bouxviller. Fr. Pat. 339,596, Jan. 28, 1904.

SODIUM chloride is added to a hot, strong solution of calcium ferrocyanide, and the crystals of sodium ferrocyanide that form are salted out from the mother-liquor of calcium chloride formed; or may be crystallised from the concentrated liquor on cooling. Reference is made to Fr. Pat. 156,416 of 1883.—E. S.

Oxides of Nitrogen; [Electrical] Manufacture of —. Siemens Bros. and Co. Fr. Pat. 339,730, Jan. 20, 1904. XI. A., page 717.

VIII.—GLASS, POTTERY, ENAMELS.

Awata Pottery; Body of —. H. Matsumoto. Mem. Coll. Science and Eng. Kyoto Imp. Univ., 1903, 1, 77—86.

AWATA pottery body is composed of Shigaraki, Majeko, Shiraye, and Mitsuishi clays, fired at the temperature of Seger cone 020—022; and the glaze is compounded of Amakusa stone and the ash of *Distylium racemosum*, and is fired at cone 7. The ware is pale straw colour, the body porous and non-transparent but hard, and the glaze is minutely crazed (or "shivered"). In analysing the materials, the clays were washed through a sieve with 60 meshes per cm. Treated in this manner Shigaraki clay leaves 30 per cent. of residue, whilst the washed portion consists of 63.13 per cent. of clay substance, 12.19 per cent. of quartz, and 24.68 per cent. of felspathic detritus. Shiraye clay leaves 16 per cent. of residue, and contains 97.05 per cent. of clay substance, 1.22 per cent. of quartz, and 1.73 per cent. of felspar; whilst Majeko clay, which is sandy, leaves 60 per cent. of residue, and is composed of 90.83 per cent. of clay substance, 5.58 per cent. of quartz, and 3.6 per cent. of felspar. The author found it advantageous to omit the Mitsuishi clay-stone. The Awata glaze consists of:—Silica, 53.00 per cent.; alumina, 11.11; iron oxide, 1.41; lime, 14.24; magnesia, 0.30; soda, 2.53; potash, 2.32; loss on ignition, 14.77 per cent. On making up a series of bodies of the foregoing materials and a very pure quartz, the author found that to give a good glaze the body should contain 30—40 per cent. of quartz to 20—12 per cent. of felspar; or 40—50 per cent. when the felspar is between 12 and 6 per cent. On the other hand, the poor colour and lack of plasticity preclude the use of these bodies for fine ware. If, however, the ware is fired in the biscuit kiln at cone 11, it will carry the glaze without crazing, provided the body contains 56.88—64.77 per cent. of kaolin, 7.11—8.21 of felspar, and 36.51—27.02 of quartz. Thus, the relative proportions of quartz and felspar of those bodies which carry the glaze without "crazing," are:—"For 2.5—6 per cent. of felspar, more than 10—30 per cent. of quartz, but less than 30—45 per cent. of quartz; for 6—12 per cent. of felspar, more than 30 per cent. of quartz."—(C. S.)

ENGLISH PATENTS.

Sheet Glass; Apparatus for the Manufacture of —. E. Rowat, Anvelais, and L. Franck, Obourg, Belgium. Eng. Pat. 9295, April 22, 1904. Under Internat. Conv., April 27, 1903.

A LOWER chamber, in which air is maintained under compression, contains a vessel charged with molten glass, and communicates at the top by a long narrow opening with an upper chamber, which is exhausted and kept cold by a refrigerating liquid circulating in compartments on each side. Through stuffing-boxes in the detachable top cover of this chamber pass vertical rods carrying clamps at their lower end, which carry between them a strip of glass. The vessel containing the melted glass is carried by the plunger of a hydraulic cylinder, which raises it in the chamber until the narrow opening of the top is slightly immersed in the glass. At the same time, the rods in the upper chamber are lowered, so as to cause the glass strip held by the clamps to pass through the opening and dip into the melted glass, which adheres to it. On raising the rods, the glass strip will draw up a portion of the melted glass through the opening, the glass being at the same time forced upwards by the difference of the air pressures in the two chambers. As the glass rises in the form of a thin sheet, it is quickly solidified, and is then detached from the melted glass by lowering the vessel containing the latter. The rods, together with the formed glass sheet, are removed from the upper chamber by taking the cover off it. (See also Eng. Pat. 9033 of 1904, this J., 1904, 660.)—A. G. L.

Drying and Baking Kilns for Ceramic Ware and the like. F. Dinz, St. Jean des Vignes, France. Eng. Pat. 12,861, June 8, 1903. Under Internat. Conv., Dec. 17, 1902.

TRUCKS filled with the products to be baked are pushed into a tunnel kiln in a continuous train. Each truck is provided with a grate and ash-pit, to prevent the fuel from coming into contact with the material to be baked. Blinds are introduced between the trucks before their admission and discharge, so as to avoid loss of heat and entry of cold air. Two galleries are arranged laterally, through which a current of air circulates, which is heated by contact with the hot walls of the kiln, and serves both for the combustion of the ignited fuel in the grates, to which it is guided by special covers, and also for the storing of the products awaiting admission to the kiln. A part of this air-current is also used to dry materials arranged in suitable galleries.—A. G. L.

IX.—BUILDING MATERIALS, CLAYS, MORTARS AND CEMENTS.

ENGLISH PATENTS.

Carborundum Articles; Manufacture of —. O. Imray, London. From the Carborundum Co., Niagara Falls, U.S.A. Eng. Pat. 9963, April 30, 1904.

IN making carborundum articles, the use of a binding agent may be dispensed with by adding sufficient water to the carborundum—part, at least, of which should be in the form of fine powder—moulding and drying the articles as usual, and then subjecting them for some time to the action of an oxidising flame at a temperature of 8500° F., whereby the grains become oxidised superficially, and adhere together. Either crystalline or amorphous carborundum may be used. Bricks, &c., may be faced with carborundum in a similar manner.—A. G. L.

Cement and Limes; Impt. relating to —. A. Denaeys, Brussels. Eng. Pat. 9765, April 28, 1904.

FIVE per cent., or more of sodium or potassium silicate is added to the Portland or other cement, either before or after burning; in the latter case the silicate should be in the form of a fine powder.—A. G. L.

UNITED STATES PATENT.

Fireproofing Solutions [for Wood]; Process of Making —. A. W. Baxter, London. U.S. Pat. 761,870, June 7, 1904.

SEE Eng. Pat. 20,592 of 1902; this J., 1903, 998.—T. F. B.

FRENCH PATENTS.

Fireproof Varnish; Manufacture of —. Eymer-Ges. Fr. Pat. 339,641, Jan. 16, 1904.

THE varnish consists of alkali silicates ("soluble glass") and asbestos or other fireproof material mixed with vegetable or mineral oils, or with oily substances such as glycerin.—A. G. L.

Building Materials, Artificial; Mechanical Manufacture of —. P. Deuil père and P. Deuil fils. Fr. Pat. 339,727, Jan. 23, 1904.

THE moulding of the bricks, &c., is effected in a hydraulic press. The size and form of the mould can be altered by means of suitable packing material, an even pressure being exerted by employing, at will, one or more compressing pistons.—A. G. L.

X.—METALLURGY.

Gold on the Rand Goldfields; Metallurgy of —. C. Dixon and M. Torrente. Electrochem. Ind., 1904, 2, 215—220.

THE authors give a full account of the recent advances and present position of the treatment of gold on the Rand.

The treatment of slimes, the zinc and electrolytic precipitation of the gold from the cyanide solutions, and the working up of by-products such as occur particularly in the cyanide treatment, are all dealt with.—R. S. H.

Gold-Silver Alloys; Solubility of — in Potassium Cyanide Solutions. J. Yokobori. Mem. Coll. Science and Eng., Kyoto Imp. Univ., 1903, 1, 65—71.

In view of the fact that native gold invariably contains a certain proportion (varying from 6 to 60 per cent.) of silver, the author examined the action of potassium cyanide solutions of different strengths (from 0.1 to 0.5 per cent.) on pure gold, gold-silver alloys containing 10, 20, 30, 40, 50, 60, 70, 80, and 90 per cent. respectively of silver and pure silver. The results are given in a series of tables. In the weaker solutions (0.1 and 0.2 per cent.) the amounts of gold and silver dissolved from the alloys vary in an irregular manner, except that with 0.2 per cent. cyanide solution the percentage of gold and silver dissolved in a given time appears to decrease gradually as the proportion of silver in the alloys increases. With the stronger cyanide solutions the solubility of both gold and silver appears to be nearly at the maximum when the alloy contains equal proportions of the two metals. The author also examined the effect of zinc shavings upon cyanide solutions. 5 grms. of the shavings were immersed in 100 c.c. of the cyanide solution, and the strength of the latter determined after 24 and 48 hours. With a 0.1 per cent. solution, the strength, after 24 and 48 hours' contact with zinc, varied from 0.070 to 0.077 and 0.064 to 0.072 per cent. respectively, whilst without zinc the corresponding figures were 0.096 and 0.092. With a 0.216 per cent. solution the figures were 0.168—0.164 and 0.08—0.136 per cent. with zinc, and 0.210 and 0.202 without zinc. With a 0.3 per cent. solution, the figures were 0.228—0.23 and 0.112—0.180 per cent. with zinc, and 0.290 and 0.274 without zinc.

—A. S.

Zinc Blende; Smelting of —. C. Ritter. Z. angew. Chem., 194, 17, 774.

THE elimination of sulphur during the roasting of blende depends largely upon the state of division of the ore, which should be in grains not larger than 1—8 mm. in linear dimensions. If finer than this it lies light and requires more room in the furnace. This preliminary treatment of the blende before reduction is more costly than that necessary for calamine; but unless it be thoroughly carried out, much zinc remains in the residues. The addition of calcined calamine to roasted blende in the melting furnace seems to assist in expelling the zinc; for while a 25 per cent. blende smelted alone yielded 81 per cent. of its total zinc, a mixture of this blende with an equal weight of a 15 per cent. calamine yielded 91 per cent. of the total zinc. Flue-dust, or zinc-white, similarly smelted, yielded practically all its zinc; so that the fineness of division of the ore in the smelting furnace has an important bearing on the yield.—J. T. D.

Aluminium; Alloys of — with Bismuth and with Magnesium. H. Pécheux. Comptes rend., 1904, 138, 1501—1503.

By the method formerly used (this J., 1904, 517), bismuth-aluminium alloys were obtained containing 75, 85, 88, 94 per cent. of aluminium; densities 2.86, 2.79, 2.78, 2.74 respectively. The alloys are sonorous, brittle, fine-grained and homogeneous, silver-white, and have melting-points between those of their constituents, nearer that of aluminium. They are not oxidised in air at the temperature of casting; but are rapidly attacked by acids, concentrated or dilute, and by potassium hydroxide solution. The fused alloys behave like those of tin-aluminium (this J., 1904, 603), but still more markedly. Magnesium-aluminium alloys were obtained with 66, 68, 73, 77, 85 per cent. of aluminium; densities 2.24, 2.27, 2.32, 2.37, 2.47. They are brittle, with large-granular fracture, silver-white, file well, take a good polish, and have melting-points near that of aluminium. They are difficult to cast, being viscous when melted; and when slowly cooled form a grey spongy mass which cannot be re-melted. They do not oxidise in air at the ordinary

temperature, but burn readily at a bright red heat. They are attacked violently by acids and by potassium hydroxide solution; decompose hydrogen peroxide, and slowly decompose water even in the cold.—J. T. D.

ENGLISH PATENTS.

Alloys having Pyrophoric Action; Manufacture of Metallic —, and their Application to the purposes of Ignition and Illumination. C. F. A. von Welsbach, Vienna. Eng. l'at. 16,853, July 31, 1903.

SEE Fr. Pat. 337,320 of 1903; this J., 1904, 484.—T. F. B.

Melting Furnaces. J. B. Orbison, San Francisco. Eng. Pat. 9445, April 25, 1904.

THE furnace, which is especially adapted for melting brass and like alloys, with the use of liquid or gaseous fuel, is mounted on trunnions, one of which is hollow for introduction of a jet of flame, and has arrangements permitting it to be mechanically oscillated. A gaseous fuel burner communicates with the hollow trunnion, and the bottom of the furnace is provided with a dam disposed longitudinally opposite a charging way at the top of the furnace, over which dam the metals flow alternately from right to left and the reverse, as the furnace oscillates, until they are thoroughly mixed.—E. S.

UNITED STATES PATENTS.

Metals; Extracting — from Ores. W. E. Greenawalt, Denver, Col., U.S.A. U.S. Pat. 761,164, May 31, 1904.

CHLORINE, obtained by electrolyzing sodium chloride, is absorbed by water; the chlorine solution is agitated with the ore in a closed vessel for some time; the solution is then displaced by fresh chlorine solution injected under pressure, followed by agitation. Finally the "desired metals" are precipitated from the solution filtered from the ore.—E. S.

Gold Separating and Recovering Apparatus. W. Laudahn, San Francisco. U.S. Pat. 762,174, June 7, 1904.

THE apparatus for the separation of gold from sand comprises a chamber containing mercury having a conical bottom with a discharge passage, a receptacle fitted to and depending from the conical bottom, and having cocks at opposite ends; a vertical cylinder of smaller diameter, through which material is delivered and submerged in the mercury; revolving scrapers extending over the upper edge of the mercury chamber, and by which the material, after rising through the mercury, is discharged; an exterior annular receiving trough, and an air-tube located within and above the trough, having jet openings through which an air-blast may be discharged outwardly.—E. S.

Minerals; Apparatus for the Concentration of —, by means of Oil. J. W. van Meter and M. P. Boss, San Francisco. U.S. Pat. 762,774, June 14, 1904.

OIL, pulped ore, and water, are supplied by a rotary distributor, divided into two compartments, to the first of a series of communicating vessels, each of which has a bottom discharge for the water and gangue, and means for maintaining a water-bed to support the oil in its course. The distributor is disposed in the upper part of the vessel to discharge near its axis, so that the rotary movements of the contents induced by the distribution of the material will tend to throw the pulp outwardly against the walls of the vessel, and facilitate the separation of the gangue. There are means at the end of the series of vessels to separate the upper and lower portions of the oil, the upper oil being returned to the first vessel by a pipe communicating with the lower compartment of the distributor.—E. S.

FRENCH PATENTS.

Steel and Armour Plates; Process for Treating —. E. Engels. Fr. Pat. 339,987, Jan. 28, 1904.

SEE Eng. Pat. 1842 of 1904; this J., 1904, 374.—T. F. B.

Zinc and Lead from Minerals; Process for Obtaining — F. H. Miller. Fr. Pat. 339,752, Jan. 20, 1904.

SEE Eng. Pat. 20,465 of 1902; this J., 1904, 188.—T. F. B.

Alloy; Manufacture of a Metallic — T. Prescott and E. Green and Son, Ltd. Fr. Pat. 339,994, Jan. 28, 1904. Under Internat. Conv., March 11, 1903.

SEE Eng. Pat. 5683 of 1903; this J., 1904, 443.—T. F. B.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(A.)—ELECTRO-CHEMISTRY.

Bromoform; Electrolytic Preparation of — E. Mueller and R. Loebe. XX., page 725.

ENGLISH PATENTS.

Insulating Purposes; Materials Suitable for Electric — E. A. Carolan, London. From the General Electric Co., Schenectady, New York. Eng. Pat. 12,312, May 29, 1903.

A REFRACTORY fibrous binding material, such as asbestos or mineral wool, is mixed with a comparatively soluble compound of an alkaline earth, such as calcium hydroxide, with or without the addition of about 10 per cent. of borax glass. The mixture, after shaping into articles of the desired form under pressure, is treated with a solution of a soluble carbonate through which carbon dioxide gas is passing, in order to form the insoluble carbonate of the alkaline earth, and the articles are finally washed and dried.—B. N.

Electric Batteries; Secondary — E. Commelin and R. Vian, Paris. Eng. Pat. 6619, March 18, 1904. Under Internat. Conv., March 18, 1903.

SEE Fr. Pat. 330,376 of 1903; this J., 1903, 1092.—T. F. B.

Reducing Organic Substances in an Electrolytic Bath; Process of — O. Irmay, London. From Farbwerke vorm. Meister, Lucius und Brüning, Höchst-on-the-Maine, Germany. Eng. Pat. 15,700, July 15, 1903.

SEE U.S. Pat. 742,797 of 1903; this J., 1903, 1355.—T. F. B.

UNITED STATES PATENTS.

Exciting Fluid for Electrical Batteries. G. F. Atwood, Assignor to Primary Power Co., Wakefield, Mass. U.S. Pat. 761,641, June 7, 1904.

SEE Eng. Pat. 29,057 of 1903; this J., 1904, 377.—T. F. B.

Exciting Fluid for Electrical Batteries. G. F. Atwood, Assignor to Primary Power Co., Wakefield, Mass. U.S. Pat. 761,642, June 7, 1904.

THE solution in which the positive pole is immersed is the same as that described in Eng. Pat. 28,057 of 1903 (see this J., 1904, 377), except that instead of 16 lb. of nitric acid and 4½ lb. of sulphuric acid, 142 lb. of nitric acid are used.—T. F. B.

Anode and Process of Making same. H. Blackman, New York. U.S. Pat. 762,227, June 7, 1904.

THE anode for electrolytic apparatus consists of a cast plate of iron that has been exposed at a high temperature to superheated steam until the exterior is converted into magnetic oxide of iron of sufficient thickness to protect the underlying iron during electrolysis. A protecting layer of glass, or a vitreous glaze, is fused as a band around the contracted portion of the anode which is to be exposed at the surface of the electrolyte.—E. S.

Battery; Electrical — J. R. Lord, San Francisco. U.S. Pat. 762,425, June 14, 1904.

THE anode is composed of an electrical conductor upon or around which is placed, or deposited during the previous use of the battery, a quantity of a compound of an anode metal. The conductor serves as the negative pole, and is

placed in such a position that any solids, chemically precipitated from the electrolyte, may fall upon or in electrical proximity to it, and thus form additional anode active material. The electrolyte is composed of one or more salts of one or more anode metals, together with one or more salts of one or more alkali metals in solution. Any suitable compound is used as a depolariser, and the cathode may be of any conducting substance chemically unattacked by the electrolyte, the whole of the materials being placed in a suitable containing vessel.—B. N.

FRENCH PATENT.

Oxides of Nitrogen; Manufacture of — [Electrical]. Siemens Bros. and Co. Fr. Pat. 339,730, Jan. 20, 1904.

AIR, or a mixture of nitrogen and oxygen, is caused to traverse an electric arc formed between electrodes of carbon combined with metallic salts, and especially with calcium fluoride. To avoid, as far as possible, the formation of carbon monoxide, the electrodes are formed with only enough carbon, mixed with the fluoride or other salt, to render them sufficiently conducting: or the gaseous mixture is so directed as to ensure the least possible contact of the mixture with the incandescent points of the carbon. Compare Fr. Pat. 335,453, 1903; this J., 1904, 193.—E. S.

(B.)—ELECTRO-METALLURGY.

Gold; Electrolytic Refining of — E. Wohlwill. Electrochem. Ind., 1904, 2, 221—224.

A SOLUTION of gold chloride containing free hydrochloric acid or a suitable chloride is used as electrolyte. If the temperature is kept up to the normal value (67° C.) and sufficient free acid is present, no chlorine appears at the anode but the gold goes regularly into solution. Moreover, when these conditions are fulfilled, a sufficiently high current density can be used to make the operation of refining as rapid as the old chemical process, which it has entirely displaced in Germany and in the U.S.A. Mint at Philadelphia. The present paper refers chiefly to the separation of gold and platinum, which is readily effected by the electrolytic method. Any platinum present in the impure gold anodes passes into solution, but is not deposited at the cathode, and consequently accumulates in the electrolyte; it is removed by precipitation with ammonium chloride from time to time. Platinum is said to be much more widely distributed than is generally supposed, and occurs in small but appreciable quantities in nearly all silver. Palladium can be separated in a similar manner, and in view of its occurrence in the Sudbury nickel ores attention is drawn to this point.—R. S. H.

Siemens Process for Winning Copper; Studies on the — M. De K. Thompson, Jr. Electrochem. Ind., 1904, 2, 225—231.

THE Siemens and Halske process of recovering copper from roasted sulphide ores, consists in leaching the finely powdered ore at 90° C. with ferric sulphate solution, containing free sulphuric acid. The ferric sulphate is reduced to ferrous salt, and copper enters solution as sulphate. Subsequent electrolytic treatment in a diaphragm cell deposits copper at the cathode and oxidises ferrous to ferric sulphate at the anode. (See Eng. Pats. 14,033 of 1886 and 3533 of 1889; this J., 1887, 734; 1890, 396.) The author has carried out a laboratory investigation of the several stages of this process. The dissolving action of ferric sulphate on cupric and cuprous oxides and sulphides was studied in detail, and then a natural copper ore was submitted to treatment. Copper pyrites before roasting is not appreciably attacked by ferric sulphate, but after roasting, in which it seems to be converted chiefly into oxide, it dissolves readily. The electrolytic treatment was carried out separately to study the anode and cathode reactions. At the cathode it was found that copper could be deposited in a firm adherent form from an acid solution of ferrous and copper sulphates until the concentration reaches a very low value, e.g., with a current density of 0.47 amp. per 100 sq. cm., until the concentration of copper in solution was 0.5 per cent., at which point the metal begins

to be spongy. The oxidation at the anode, using carbon electrodes, is at first very efficient, but as the concentration of ferrous sulphate decreases, the process gradually falls off in efficiency.—L. S. H.

Fused Zinc Chloride; Preparation of Pure —, and its Electrolysis. S. Gruenauer. Z. anorg. Chem., 1904, 39, 389—476.

LORENZ (this J., 1896, 279) has shown that zinc chloride, even after it has been kept in the fused state until evolution of steam can no longer be detected, still retains a certain proportion of water and cannot be satisfactorily electrolysed.

Preparation of Pure Zinc Chloride.—The author finds that by the following method pure anhydrous zinc chloride can be prepared, which on electrolysis behaves quite satisfactorily, giving at once zinc and chlorine. 40 grms. of zinc chloride are dissolved in 20 c.c. of hydrochloric acid of sp. gr. 1.19 and the solution evaporated in a tube of refractory glass, through which a current of dry hydrochloric acid gas is passed at the rate of 350 bubbles per minute. The temperature is gradually raised, and after some time the mass solidifies; at the moment of solidification, hydrochloric acid gas is evolved from the mass. The solid zinc chloride is tused as rapidly as possible, and the current of hydrochloric acid gas kept passing through. Any steam which condenses in the apparatus is driven over by means of a second gas burner. The dehydration of the zinc chloride is complete in 75 minutes. Attempts to substitute carbon dioxide and air for the hydrochloric acid gas gave unsatisfactory results, and the author considers it probable that the zinc chloride forms with the hydrochloric acid an addition compound, which is again split up at the temperature at which the mass solidifies. This method of dehydration can be applied to concentrated solutions of zinc chloride, and is not affected by the presence of foreign substances. It is probably applicable for the preparation of all anhydrous hygroscopic chlorides, e.g., carnallite, calcium chloride, and the chlorides of the rare earths.

Electrolysis of Pure Anhydrous Zinc Chloride.—The carbon electrodes used should be dried in an air-bath, not by ignition in the Bunsen flame. The current-yield increases with increasing current-density, but the differences are very small with currents of more than 1.5 amperes. With increase of temperature (from 525° C. to the boiling point of zinc chloride, 732° C.) the current-yield falls, the more rapidly the nearer the boiling point of the electrolyte is approached. By fractional electrolysis of a mixture of iron and zinc chlorides, pure iron and pure zinc can be obtained, but the complete separation of the iron only takes place gradually, the last traces of iron being especially difficult to separate. With a mixture of equimolecular amounts of zinc and potassium chlorides the current-yields are much higher than with pure zinc chloride; for example, with 0.5 ampere, the yields were 59 and 23 per cent. respectively. This increased yield is due to the fact in the presence of alkali chlorides, the formation of "metal fog" in the electrolyte is prevented. The current-yield increases with increasing current-density, but the differences are inconsiderable with a current of more than 2 amperes. This mixture of zinc and potassium chlorides gives yields which approach those required by Faraday's law. With a mixture of equimolecular amounts of zinc and sodium chlorides, the current-yields are higher than with pure zinc chloride, but not so high as with the corresponding mixture of zinc and potassium chlorides. The variation of yield with current-density is the same as with the latter mixture. A mixture containing 35.36 per cent. of sodium chloride gives better yields at the higher current densities (1 ampere and above) than the equimolecular mixture. The fact that the addition of sodium chloride to zinc chloride improves the current-yield is of importance, as it points to the advantage of recovering zinc electrolytically from the waste zinc chloride liquors from dyeworks, which contain considerable quantities of sodium chloride.

Formation of "Metal Fog" in the Electrolysis of Fused Zinc Chloride.—The conditions which most favour the formation of "fog" are low temperature and high current-density. By raising the temperature a melt containing

"metal fog" becomes clear, but the "fog" appears again if the temperature be lowered. (See also this J., 1900, 670, 1001, 1024; 1902, 975; 1903, 1053.)—A. S.

ENGLISH PATENTS.

Electro-depositing Metals on Parabolic Reflectors and Analogous Articles; Improved Method of, and Means for —. B. J. and A. Round, Birmingham. Eng. Pat. 9531, April 23, 1903.

THE parabolic reflector, or other article with a concave or analogous form, is made the cathode and rotated in the electrolyte, or a relative rotary motion is maintained between the cathode and anode, the latter consisting of a sheet of silver beneath and extending into the crown of the anode, and made to conform in shape with the inside contour of the surface of the article to be silvered. The cathode is suspended in the electrolyte in an inverted position, and, by means of a small vent in the crown, the escape of gas is provided for, and the space between anode and cathode remains filled with the electrolyte.—B. N.

Tantalum and like difficultly Fusible Metals; Manufacture of Homogeneous Masses of —. C. D. Abel, London. From Siemens and Halske Act.-Ges., Berlin. Eng. Pat. 26,775, Dec. 7, 1903.

SEE Fr. Pat. 337,607 of 1903; this J., 1904, 494.—T. F. B.

UNITED STATES PATENT.

Furnace; Electric —. C. P. E. Schneider, Le Creusot, France. U.S. Pat. 761,920, June 7, 1904.

SEE Eng. Pat. 28,805 of 1903; this J., 1904, 549.—T. F. B.

FRENCH PATENTS.

Electric Arc Furnaces. Soc. de Métal. Electro-Thermique. Fr. Pat. 339,593, Jan. 14, 1904.

IN order to concentrate the heat from open arcs upon any material to be heated by radiation, the cover of the furnace is brought as near the electrodes and the hearth of the furnace as possible. A double-walled cover is provided with a closed gas space between the two sections, the inner wall being made of graphite, the outer of refractory bricks. The material to be fed into the furnace passes down long inclined shoots at each end of the furnace, which serve also for leading off the gases from the heated zone. Two arcs are employed, one towards each end of the furnace, so that their heating effect serves both for the material on the hearth of the furnace and for that passing down the shoots towards this hearth.—R. S. H.

Furnace; Rotatory and Oscillating Electric —. I. Braun. Fr. Pat. 339,942, Jan. 27, 1904.

AN inner retort is made of refractory material and has protuberances on its inner surface to assist in the mixing of the materials during the rotation of the furnace. The retort is surrounded by the resistance material, the latter being made in the form of plates so as to ensure the central axis of the retort being kept in its true position during the movement. The resistance material is in contact with electrodes of graphite, which are separated from one another by insulating walls of highly refractory material, such as carborundum or "siloxicon," and the furnace is finally surrounded by a water jacket. The furnace is provided with an air-box communicating by blast pipes with the interior of the retort, so as to supply materials, with or without air, capable of assisting in the reactions. By means of wheels gearing with endless screws, the furnace may be given two movements, one of rotation around the axis of the furnace, and an oscillatory movement around an axis at right angles to the axis of the furnace.—B. N.

Metals, such as Lead and Silver; [Electrolytic] Extraction of — from their Ores. Accumulatoren-fabrik. Act.-ges. Fr. Pat. 339,849, Jan. 23, 1904.

SULPHIDE or other ores either before or after oxidation are treated with such a molten halogen salt as is capable of reacting with them to form the corresponding zinc or silver compound. The fused product is submitted to electrolysis and the metal collected at the cathode.—R. S. H.

XII.—FATTY OILS, FATS, WAXES, AND SOAP.

Mustard Oil as a Lubricant. A. Rohrbach. Organ f. Oel- u. Fett-Handel., 1904, 57, [24].

Tests of mustard oil gave the following results:—Sp. gr., 0.916 at 15.5° C. Viscosity (Engler), 0.90 at 20° C., 0.40 at 40° C., 0.21 at 60° C., 0.14 at 80° C., 0.11 at 110° C., 0.09 at 150° C. The lubrication tests in the Martens' machine gave the following increases in temperature:—Under a load of 10 kilos. per sq. cm., at a peripheral velocity of 0.5 metre per second, 2.9° C., and at 2 metres 2.7° C.; under a load of 40 kilos., 9.8° C., and 22.1° C. respectively. At 9° C. the oil becomes slightly turbid. The flashing point (Pensky) is above 220° C.; acidity, 0.062 per cent. calculated as sulphur trioxide. The oil will stand heating to 180° C. without frothing. It furnishes a clear solution in benzene, and does not "gum" when spread out in thin layers and exposed to the air for 6 days.—C. S.

ENGLISH PATENTS.

Fish Oil and Fish Guano; Process and Apparatus for the Continuous Manufacture of Sterilised —. H. J. A. Pompe van Meerdervoort, Haag, Netherlands. Eng. Pat. 9018, April 19, 1904.

SEE Fr. Pat. 838,472 of 1903; this J., 1904, 670.—T. F. B.

Soap for Dyeing and Cleaning; Manufacture of —. A. J. Boul. From C. W. Horton. Eng. Pat. 23,508, Dec. 28, 1903. V., page 713.

Saponifying Fats and Oils; Material for —, and a Method for Obtaining it. M. Nicloux, Paris. Eng. Pat. 8233, April 19, 1904. [Specification dated April 9, 1904.] Under Internat. Conv., Oct. 14, 1903.

SEE Fr. Pat. 335,902 of 1903; this J., 1904, 327.—T. F. B.

UNITED STATES PATENTS.

Wool-fat; Process of Recovering —. C. E. Swett, Providence, R.I. Assignor to R. H. Hutchinson, New York. U.S. Pat. 761,265, May 31, 1904. ✓

The washings from the wool are treated with an alkali manganate or permanganate and then with an acid, and the magma rising to the surface is freed from excess of water and extracted with a volatile solvent.—C. A. M.

Extracting Oil; Apparatus for —. M. Kirshner, Lynchburg, Va., U.S.A. U.S. Pat. 761,686, June 7, 1904. ✓

A ROTATING drum is situated in an outer casing. On the surface of the drum are a number of pockets to receive the material, which is compressed by plungers, situated in the pockets. Means are provided for actuating the plungers, for collecting the expressed oil, and for removing the residue.—W. H. C.

Fatty Acids; Process of making —. W. Connstein, Assignor to Verein Chem. Werke Act.-Ges., Charlottenburg, Germany. U.S. Pat. 762,026, June 7, 1904.

SEE Fr. Pat. 328,101 of 1902; this J., 1904, 69.—T. F. B.

FRENCH PATENT.

Fats; Process of Treating — in the Stearine Industry. L. F. Fournier et Cie. Fr. Pat. 339,885, Jan. 6, 1904. ✓

A CURRENT of compressed air is passed through the fatty substance heated to about 115° C. This is stated to accelerate the process and improve the yields when used in conjunction with different methods of saponification.

—C. A. M.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(A.)—PIGMENTS, PAINTS.

Prussian Blue in Spent Oxide, &c.; Determination of — by Feld's Method. R. Witzack. XXIII., page 728.

ENGLISH PATENT.

Binding Media for Oil Colours. J. E. Kollinger, Munich, Germany. Eng. Pat. 17,120, Aug. 6, 1903.

SEE U.S. Pat. 738,456 of 1903; this J., 1903, 1096.—T. F. B.

FRENCH PATENT.

Lakes [from Azo Dye-stuffs]; Process for Preparing New —. Soc. anon. Prod. F. Bayer et Cie. Fr. Pat. 339,606, Jan. 14, 1904. IV., page 713.

(B.)—RESINS, VARNISHES.

Colophony; Distillation of — with Zinc Dust. C. Stiepel. Augsburg's Seifensieder-Zeit., 1904, 31, 262. Chem.-Zeit., 1904, 28, Rep., 179.

A QUANTITY of colophony was melted, the amount of zinc dust necessary to neutralise the resin-acids (about 10 per cent.) added, and the mixture distilled in a small cast-iron retort. The course of the distillation and the products obtained were the same as by the usual distillation process, but the distillate was almost entirely free from acid.—A. S.

FRENCH PATENT.

Fireproof Varnish; Manufacture of —. Vymer-Ges. Fr. Pat. 339,641, Jan. 16, 1904. IX., page 715.

(C.)—INDIA-RUBBER, &c.

Litharge and Vulcanisation. E. Schulze. Gummi-Zeit., 1904, 18, 749—751.

THE rôle litharge plays in rubber mixings, to which it is added to aid vulcanisation, is commonly supposed to be that of a sulphur carrier, but, in the author's opinion, the effect is to be traced to purely physical causes. On the mixing rolls the sulphur and litharge particles become surrounded by a film of rubber. Where a sulphur particle alone is enclosed, the sulphur would combine with the rubber, forming normal soft rubber, and if more sulphur than is necessary for vulcanisation be present, the excess dissolves in the rubber substance, passes through without further combination, and is absorbed on coming into contact with particles of litharge. In the case of particles of sulphur and litharge being enclosed together, the sulphur will first combine with the litharge. The lead sulphide formed has no effect on the vulcanisation, but both it and litharge hasten vulcanisation very considerably by acting as conductors of heat. That such a mixing is a good conductor (comparatively) is shown by the fact that motor tyres made therewith become hot in use much more quickly than other tyres. The hardening effect of litharge is due probably to the saponification of the rubber resins, lead salts being formed of a higher melting point than the original resins.—J. K. B.

UNITED STATES PATENT.

Vulcanised Rubber; Regenerating —. R. B. Price, Chicago. U.S. Pat. 762,843, June 14, 1904.

GROUND waste rubber is boiled with a saturated or super-saturated solution of caustic alkali with or without pressure. —J. K. B.

XIV.—TANNING; LEATHER, GLUE, SIZE.

Tanning Materials; Composition of Liquors of similar Concentration from different —. J. Paessler. Günther's Gerber-Zeit., 1904, 21—23. Z. angew. Chem., 1904, 17, 789.

IX liquors of 2° Baume were determined the contents of tannin and of non-tannin substances, and in liquors containing 2 per cent. of the tannin substance were determined the content of non-tannin substance and the specific gravity. It was found that:—1. The specific gravity is dependent upon the content both of tannin- and of non-tannin substance; the ratio of tannin- to non-tannin substance varies widely in different materials. 3. The specific gravity of the non-tannin substances is higher than that of the tannin-substances.—J. T. D.

Pickling Method; Improved — A. Seymour-Jones. *Collegium*, 1904, 186—187.

FORMIC and acetic acids are proposed as substitutes for sulphuric acid in the usual acid and salt pickle, so as to avoid the destructive action of the last-named acid. Skins were limed and carried to the drenching and scudding stage, and then paddled in 0.25 per cent. solution of formic acid at 70° F., and left to soak in the acid for 24 hours. They were then paddled in a saturated solution of common salt and again left to soak for 24 hours. The result, as regards colour, was excellent. These skins were sent on a journey of 57 days, and all the time exposed to the worst conditions. Half the skins were then tanned out under the conditions laid down in the Society of Arts Report on Leather for Bookbinding (this J., 1901, 819, and 1902, 128), and proved most successful. The remainder, after eight months, were still unchanged, and no mould appeared at any time. The cost of this process is about the same as when sulphuric acid is used. White pyroligneous acid (distilled to free it from iron), diluted to contain 0.1 to 0.2 per cent. of acetic acid, has proved equally efficient and somewhat cheaper.—B. L. J.

Tannin Determination [Filtration of Quebracho and Mangrove Extracts]. K. Schorlemmer. *XXIII.*, page 730.

Chromic Oxide in Chrome Leather; Note on the Determination of —, and Separation of the same from Aluminium Oxide in presence of Aluminium Salts. H. R. Proctor. *XXIII.*, page 729.

UNITED STATES PATENT.

Paper Pulp; Manufacturing — [and *Extracting Tannin*]. O. Cair. U.S. Pat. 762,139, June 7, 1904. *XIX.*, page 725.

FRENCH PATENTS.

Tannage of Skins; Process and Plant for Quick — H. de Marneffe. Fr. Pat. 339,428, Jan. 8, 1904.

HOLLOW box-like structures are formed by attaching the skins to deep rectangular frames. These are packed into a closed casing or container, each box being connected to a vent pipe passing outside the container. Tanning liquors are pumped into the container, percolate through the skins and pass by the vent pipes into a tank, from which the pump again circulates them. When tanning is complete, the skins are stuffed, fat-liquored, &c., in a similar manner, without further disturbance or handling.—R. L. J.

Rice Flour; Treatment of — for Use in Finishing Yarns and Textiles. Soc. anon. des Rizeries Françaises. Addition to Fr. Pat. 334,369 of Aug. 1, 1903. *XIX.*, page 725.

XV.—MANURES, Etc.

Commercial Manures; Influence of Lime on the Efficiency of the Phosphoric Acid of —. B. Schulze. *Fähling's Candio-Zeit.*, 1904, 53, 183; *Chem.-Zeit.*, 1904, 28, Rep., 158—159.

THE author's experiments give the following results:—(1) The phosphoric acid of bone-meal (whether free from gelatin or not) exerts on a soil poor in lime an action similar to that of the phosphoric acid soluble in citric acid. (2) Simultaneous liming influences the action of the phosphoric acid soluble in water but little, that of the acid soluble in citric acid more, and that of the phosphoric acid of bone-meal still more. (3) When the phosphoric acid manure is applied in the spring, the greatest harm is effected by the use of quicklime in the spring, then comes autumn application of quicklime, next the use of calcium carbonate in spring, and finally calcium carbonate applied in the autumn, which has the least injurious action. (4) The phosphoric acid of bone-meal varies in its action according to the time and form of the liming, yet the beneficial action of the phosphoric acid and the amount of it assimilated are always so much diminished as to show that bone-meal and lime should never be applied to the same crop. (5) One of the

causes of the diminution in crop produced by lime lies in the action of the latter on the phosphoric acid of the soil, which is rendered difficultly soluble. Experience shows that the acid compounds of the soil are indispensable in rendering useful difficultly soluble phosphates.—T. H. P.

Calcium Sulphide for the Destruction of Cuscuta ["Dodder Weed"] and other Parasites in Agriculture. F. Garigou. *Comptes rend.*, 1904, 138, 1549—1550.

THE author has employed powdered calcium sulphide with great success for the destruction of blights and parasitic weeds among vegetables, fodder, and garden plants. For the "dodder weed" in fields of lucerne calcium sulphide is superior to any other destructive agent, and kills the weeds in 48 hours. It kills insects on beans, peas, and rose-trees. In order to ensure its full activity it is necessary either that the weather should be moist, or that the powder should be moistened after it has been applied, thereby liberating sulphuretted hydrogen.—J. F. B.

FRENCH PATENTS.

Ammonium-Magnesium Sulphate; Manufacture of —, and the Application of this Salt as a Manure in Agriculture. J. D. D. Thierry. Fr. Pat. 339,416, Jan. 7, 1904.

AMMONIUM-magnesium sulphate is formed by passing ammonia gas into a strong solution of magnesium sulphate, mixed with the proper proportion of sulphuric acid, and removing the crystals that form. Or, solution of ammonium sulphate and of magnesium sulphate, in atomic proportions, are mixed, and the crystals that form are withdrawn, the mother-liquor being used in making fresh solutions. The application of the salt as a fertiliser is also claimed.—E. S.

Sodium Bisulphate; Industrial Utilisation of — [Manure]. L. A. Angibaud. Fr. Pat. 339,820, Jan. 25, 1904.

FISH waste, or other animal garbage, is immersed in a boiling strong solution of nitre-cake, or in the same in a molten state. The syrupy liquid thus produced is worked up with powdered fossil or other phosphates, and the mass is allowed to cool and consolidate in heaps, when it may be powdered for use as a manure.—E. S.

XVI.—SUGAR, STARCH, GUM, Etc.

Diffusion; Chemical Treatment during — A. Besson. *Bull. Assoc. Chim. Suer. et Dist.*, 1904, 21, 1126—1133.

THE author determined the quality of diffusion juice when the chips had been subjected to preliminary treatment or when chemicals had been added to the water used. Diffusion with ammoniacal or amine solutions has a practical interest in consequence of the tendency to use for diffusion the alkaline condenser waters in order to save the heat. The introduction of ammoniacal waters was found to be prejudicial, the purity of the raw juice being sensibly diminished and the defecation and carbonation seems being increased in quantity and in viscosity, although the juice is slightly lighter in colour than ordinarily. Pure amines act favourably on the juice, but the ordinary amines containing ammonia produce unfavourable effects. Certain factories use sodium bisulphite as an antiseptic in the diffusion battery, chiefly at rasping stations, to disinfect the battery, render the juice more stable and diminish the production of gas. The first effect of bisulphite solutions is to decolorise the chips and the juice; the purity is not decidedly altered, and no invert sugar is formed. In carbonated juice a little more lime is present, and the juices frequently become cloudy after filtration and possibly have a greater tendency to form incrustations. It would be better to use a solution of sulphurous acid made on the spot; 0.4—0.5 grm. of sulphur dioxide may be used without fear of inversion. The rendering of juice neutral by the addition of chalk does not appear to give purer juice. Sodium bicarbonate (0.5 grm. per litre) gives a slight improvement in purity, but when the chips are made alkaline with sodium carbonate or aluminate, the purity is

diminished. The effects obtained by using alkaline and acid oxidising reagents may be explained by the above results. Chips treated with carbon dioxide give up an enormous amount of gas during diffusion, and the purity is sensibly lowered. The abundant disengagement of gas in carbonic diffusion may serve to explain abnormal evolution of gas when beetroots that have been long stored are worked up. The lessened vitality of the beets in silos badly ventilated, allows of an accumulation of the gas produced by the respiration of the roots, and this gas is subsequently given off in the battery.—L. J. de W.

Incrustation [Sugar Works]; Use of Aluminium and its Compounds for Preventing — A. Besson. Bull. Assoc. Chim. Sucr. et Dist., 1904, 21, 1136—1137.

As the efficacy of aluminium salts in preventing the formation of an incrustation during concentration is dependent on the alkalinity of the juice, it is preferable to use some compound containing a feeble and volatile acid, and bisulphite of aluminium specially prepared in concentrated solution is found to answer, while at the same time the juice gets the benefit of a slight sulphiting. The quantity to be added to second carbonated juice with an alkalinity of 0.15 to 0.20 is 0.31 to 0.02 gm. of alumina per litre, the juice being then concentrated without further filtration. The larger amount of reagent diminishes the alkalinity about 0.07. The lime and silica are thrown out as a granular, non-incrustant silico-aluminate of lime.—L. J. de W.

"Mangifera Indica" L. [Mango Tree]; The Gum of — P. Lemeland. J. Pharm. Chim., 1904, 19, 584—593.

The gum of the mango tree is sold as an astringent drug in India. It occurs in lumps varying in size from that of a nut to that of a small egg, of an amber to reddish-yellow colour, almost transparent and showing a brilliant conchoidal fracture. The sample studied contained 16.57 per cent. of moisture and the mucilage was only partially soluble in water. Calculated on the dry substance, the soluble portion amounted to 39.36 per cent. The soluble portion possessed a rotatory power $[\alpha]_D = -25.33^\circ$. The gum contains a directly oxidising enzyme (aëroxydase). When hydrolysed by 3 per cent sulphuric acid, the gum, in the air-dry state, yielded 71.42 per cent. of reducing sugars calculated as invert sugar, which included 73.33 per cent. of galactose and 35.09 per cent. of pentoses. Arabinose was isolated from the latter in the crystalline condition. The portion of the mucilage insoluble in water yielded 86.28 per cent. of reducing sugars, calculated on the substance containing 10.51 per cent. of moisture. These sugars included 32.08 per cent. of galactose and 42.37 per cent. of pentoses.—J. F. B.

UNITED STATES PATENT.

Achroo-dextrin; Process of Making — G. Reynaud, Paris. U.S. Pat. 761,542, May 31, 1904.

ACHROO-DEXTRIN, it is stated, may be prepared from "acid peats" by mixing the peat with 3—5 times its weight of water and heating the mixture under a low pressure in a digester to a temperature of 110° — 150° C. for 30—60 minutes, according to the degree of acidity of the peat, thereby converting the amylaceous matters of the peat into dextrin.—J. F. B.

FRENCH PATENT.

Sugar; Boiling and Crystallisation of —, at a High Temperature. J. B. L. Aurientis and R. Fontenilles. Addition, dated Nov. 11, 1903, to Fr. Pat. 326,433, Nov. 18, 1902. (See this J., 1903, 812.)

The present addition deals with the crystallisation of sugar contained in saturated syrups at a temperature higher than 100° C., with the addition of grain sugar ("semoule") in varying proportions according to the degree of saturation of the syrup. The residual syrup from each operation is used for melting a fresh quantity of sugar similar to that which yielded it, so as to avoid second and third runnings sugars.—T. H. P.

XVII.—BREWING, WINES, SPIRITS, Etc.

Enzyme, [Anaëroxydase]; Study of the Action of an Indirect Oxidising — E. Pourquelot and L. Marchadier. Comptes rend., 1904, 138, 1432—1434.

THE oxydases proper [aëroxydases] take up oxygen from the air and transfer it to certain oxidisable bodies; the indirect oxydases [anaëroxydases] on the other hand only exert an oxidising action in presence of hydrogen peroxide or similar bodies, which they decompose. The authors have studied the action of the anaëroxydase present in an infusion of oatmeal upon vanillin in presence of hydrogen peroxide. The experiments were carried on at a temperature of 30° — 33° C. for 24 hours. The product of the oxidation was identified as *dehydrodivanillin*, which is the same product as is formed by the action of the aëroxydase of gum upon vanillin. The aëroxydases and anaëroxydases possess certain other properties in common; in particular, the presence of as much as 50 per cent. of alcohol does not interfere with their activity, but minute proportions of hydrocyanic acid paralyse them. The authors take the view that the aëroxydases are composed of a mixture of two enzymes, one a *hydroxydase*, capable in presence of air of converting water or certain other bodies into the corresponding peroxides, and the other an indirect oxydase decomposing these peroxides with liberation of active oxygen (compare this J., 1903, 384).—J. F. B.

Yeast; Toxic Action of Chromium Compounds on — E. Pozzi-Escot. Bull. Assoc. Chim. Sucr. et Dist., 1904, 21, 1141—1142.

EXPERIMENTING on a bottom fermentation beer yeast at 19° — 20° C., the author finds that the toxic action of chromium compounds depends on the nature of the combination of the chromium in the compound, the action being a maximum for chromic acid and a minimum for salts of chromium. The effect of 0.1 grm. of chromic acid per litre is clearly marked even in presence of a large quantity of yeast; chrome alum only begins to produce an effect when 3.5 grms. per litre are added, and the growth is still active when 10 grms. are present.—L. J. de W.

Zymase and Alcoholic Fermentation. P. Mazé. Comptes rend., 1904, 138, 1514—1517.

THE decomposition of sugar into alcohol and carbon dioxide is a very general phenomenon in living cells under normal conditions. Zymase is an enzyme of aerobic life and its action on sugar is to be regarded as a digestive phenomenon. In *Eurotiopsis Guyoni* (see also this J., 1902, 287) the zymase is found exclusively in contact with air in strictly aerobic cells; their richness in zymase decreases with the age of the cells, and it soon disappears entirely. The formation of zymase in absence of air, in plants which apparently have lost their zymase, should be considered not as the result of an effective production, but as a regeneration, more or less slow and incomplete, of zymase which has lost its activity. In normal life the zymase is destroyed after it has acted, probably by oxidation, and alcoholic fermentation in anaërobic life is to be regarded as the continuation of an enzymic action originally aerobic. Under anaërobic conditions the zymase is enabled to accumulate, and continues to produce alcohol after the yeast has ceased to multiply and assimilate that product. As regards the mechanism of the action of zymase, the author expresses a view identical with that formulated by Buchner and Meisenheimer (this J., 1904, 252).—J. F. B.

Pure Yeast System; Application of Hansen's — for English Stock Beers. N. H. Claussen. J. Fed. Inst. Brewing, 1904, 10, 308—315.

THE system of single-cell yeast has not hitherto gained a footing in England for the manufacture of stock beers, owing to the fact that the type of secondary fermentation peculiar to English beers cannot be effected by the same yeast as carries out the primary fermentation. Hitherto, the existence of specific secondary yeasts has only been assumed, but the author has now discovered a new, non-

sporulating, budding fungus, belonging to the *Torula* group, which possesses the peculiar property of conditioning beer in such a way as to create the typical English flavour and condition. This fungus, to which the name of *Brettanomyces* is given, exists in several varieties, some of which are harmful. It produces a slow fermentation in wort or in beer fermented by ordinary brewers' yeast; the carbon dioxide produced by its action is retained very firmly, and forms a copious and lasting foam. A somewhat considerable amount of acid is formed, accompanied by ethereal substances, which at once call to mind the flavour of stored English beer. If a few drops of a pure culture of *Brettanomyces* be sown in a bottle of pasteurised beer and stored at a temperature of 75°–85° F. for 10–14 days, the beer acquires the English character. The beer employed for this purpose should have reached a certain limit of attenuation during primary fermentation. The author suggests that *Brettanomyces* is a minor constituent of English pitching yeast, or may enter the beer at some stage as an infection, and that its presence is indispensable for the secondary fermentation. He proposes that the question of single cell yeast for English beers should be re-opened, that the primary fermentation should be conducted with pure beer yeast, and that pure cultures of selected varieties of *Brettanomyces* should be employed for secondary fermentation.

—J. F. B.

Malting and Brewing; Transformation of the Albuminoids during — F. Weis. Z. ges. Brauw., 1904, 27, 385–389, 405–407, 420–423, 440–445.

AFTER giving an account of the nature and proportions of the different nitrogenous constituents of barley and malt, so far as they are known, the author discusses the action upon them of the proteolytic enzymes of the malt. Green malt contains a coagulating enzyme, similar to rennet, which coagulates milk, and two proteolytic enzymes, one resembling pepsin and the other trypsin. Referring to a previous paper (this J., 1901, 141), written before the dual nature of the proteolytic enzymes of malt was recognised, the author describes how he now uses stannous chloride for precipitating the true albumins, zinc sulphate for precipitating the albumins and albumoses, and tannic acid for precipitating all albuminoid derivatives higher than the amides and similar simple products. The comparison of the nitrogenous contents of the filtrates from each of these precipitates then enables him to differentiate between the products of the action of the peptic enzyme and those of the tryptic enzyme. The first stage of proteolysis [of wheat gluten] by malt, corresponding to the action of the peptase (degradation down to albumoses), proceeds with considerable rapidity; the action is notable even at low temperatures and acquires its greatest intensity at 51° C., at which temperature it is nearly twice as strong as it is at 35° and at 60° C. The tryptic proteolysis (degradation from albumoses down to products unprecipitated by tannic acid, e.g., amides) takes place very much more slowly than the peptic proteolysis. The action at temperatures below 15° C. is almost nil, and it proceeds with greatest intensity at 45°–50° C., but the action at 35° C. is very little weaker than at 47° C. Both enzymes cease to act at temperatures about 70° C. In practice, therefore, the result of the proteolysis will be different according to whether the mash is started at 35° C. and raised only slowly or whether it is started at 50°–60° C. The proteolytic enzymes are unaffected by the kilning process; their action is not confined to albumins of the same origin but extends to other albumins, of animal or vegetable origin, which may be added to the mash. There is little doubt that the germinating power of barley depends to a great extent on the activity of the proteolytic enzymes, and these should therefore play a part in the determination of the malting value of barley. Analyses of malt mashies on the large scale, starting at 35° C. and rising only slowly, showed that no notable increase in the proportion of albumoses took place during mashing. The proteolytic action was most intense during the second and third hours of the mashing, but the increase of total nitrogen was mainly accounted for by an increase of products of the lowest types [amides and the like]. A considerable amount of soluble albumin survived the mashing, whence it is concluded that a portion of the malt-albumin is practically

unattackable by the proteolytic enzymes. It may be assumed that the rapidly acting peptase has converted all that it is capable of attacking during the period of germination on the floor and that the bulk of the proteolysis during mashing is performed by the tryptase. The slow method of mashing with low initial heats is not favourable to the presence of a high proportion of albumoses in the wort; if albumoses be required, all the above observations indicate that Windisch's high temperature, rapid-mashing process should be followed. Another possible means of raising the proportions of albumoses is to add to the mash unmodified materials of an albuminoid nature capable of proteolysis by the peptase. The author found that the addition of wheat flour did indeed increase the proportions of soluble albumins and albumoses in the worts whilst decreasing the proportion of amides, the total nitrogen remaining the same as with malt alone. The addition of maize flour, on the other hand, caused a decrease of the amounts of total nitrogen, soluble albumins, and albumoses, whilst increasing relatively the proportion of amides. It is pointed out that from a practical point of view the addition of wheat flour is out of the question, but if it be desired to brew a wort containing a minimum proportion of total nitrogen without reducing that of the amide yeast-foods, the addition of raw maize may lead to that result.—J. F. B.

[Wort] Coolers; Use and Abuse of — L. Briant. J. Fed. Inst. Brewing, 1904, 10, 286–298.

THE results of the passage of the wort through the open cooler are discussed under the following heads:—

Infection.—The temperature at which the wort is generally discharged from the cooler is 165° F., but after about two-thirds of the total quantity have run off, the temperature will have sunk to 140° F., and the last few barrels may have cooled down to 120° F. before they are discharged. The number of infecting organisms which enter the wort in the cooler is enormous, even under favourable conditions, but the damage done by infection does not become serious unless the temperature becomes dangerously low before the wort has been run off. It is advisable, therefore, to sterilise the last few barrels of wort from the cooler by re-boiling before passing on to the refrigerator. The chief sources of infection are the proximity of orchards and stables and the entrance of dust from the barley and malt machinery; it is sometimes advantageous to enclose the cooler room and to admit to it nothing but filtered air.

Deposition of Sludge.—The wort leaves the hop-back in a clear condition, but as the temperature falls a flocculent deposit separates out in variable amounts. This deposit contains, in addition to mechanical impurities, albuminoid matters, hop-resins, and mineral matters. It is desirable, but not perhaps absolutely essential, that this sludge should not be allowed to pass on to the fermentation tuns.

Hot Aeration.—One of the most important objects of the cooler is to enable the wort to combine at a high temperature (180°–190° F.) with a suitable quantity of oxygen. This object can, however, be attained very effectively by the injection of air into the main through which the hot wort is being pumped. In large ordinary coolers it is sometimes advisable to run the wort continuously through them, withdrawing it at the surface. In the case of double coolers, a thin film of wort may be exposed to the air in the top vessel, whilst it is run continuously into the deeper, protected, lower vessel for sedimentation.—J. F. B.

Top-Fermentation Beers; Chilling and Filtering of — III. H. van Laer. J. Fed. Inst. Brewing, 1904, 10, 347–355.

THE author describes, and reports favourably on, the Wittemann system of collecting the aromatic gases of fermentation, and applying them for the carbonation of beer (this J., 1904, 618). In order to obtain a fine aroma in chilled and carbonated beers, the author strongly recommends the Continental practice of passing the boiling wort from the coppers on to dry hops in the hop-back.—J. F. B.

Fermented Beverages; Native African — H. van Laer. Ann. de la Brass., 1904, 7, 241–244.

THE natives of Africa prepare a number of fermented drinks by spontaneous fermentation, the yeasts being either

present in the raw materials used or introduced by insects. The author divides these drinks into two classes—"wines" from materials containing directly-fermentable sugars; and "beers," the preparation of which entails the collaboration of an amylase. *Masanga* is a wine made from sugarcane by the natives of the Upper Congo. Just before the flowering season, ripe juicy canes are cut into 2-inch lengths, and crushed in a mortar, the pulp being strained, and the filtered juice diluted with water, and left to ferment spontaneously, in jars, for 24 hours, in a shady place. The product is sweet, with a small amount of gas, very agreeable flavour, although rarely bright. Left for a day in bottle, it acquires good condition, but it soon turns sour. The sample examined by the author contained 14.72 grms. of dry extract per litre, 25 of alcohol, 1.636 of mineral matters, 2.4 of volatile acids (as acetic acid), 9.3 of non-volatile acids (as lactic acid), no saccharose, and only traces of glucose and proteids. It manifested slight dextro-rotation. The sediment contained numerous microbes, and a small spherical yeast with thick-walled cells, often grouped in pairs and fours. *Malafou* is the fermented juice of the oil palm, from incisions in the bark. The wine is colourless, opalescent, and contains 16.66 grms. of dry extract per litre, 38.2 of alcohol, 2.9 of mineral matters, 4.2 of volatile acids, 9.99 of non-volatile acids, and 7.1875 of proteids, but no saccharose or glucose. The gravity at 15° C. is 1.00168, and it has a slight dextro-rotation. The sediment consisted of microbes and various yeasts with granular cell contents. *Tokko* is a sorghum or millet beer prepared by the Sakarras, the grains being malted in a primitive fashion, dried in the sun, crushed with a little water, and afterwards diluted and heated in earthen pots. This treatment seems to facilitate conversion, the malt having only a feeble diastatic power. When cold, the mass is left to ferment spontaneously for 24 hours. The beer contains 81.87 grms. per litre of dry extract, 31.12 of alcohol, 5.687 of proteids, 0.36 of acetic acid, and 1.665 of lactic acid, but no reducing substances. It is yellow in colour, with peculiar odour and acid flavour. The sediment contains microbes, yeast cells, and cells of *Schizosaccharomyces Pombe*, with numerous unaltered granules of starch, indicating the absence of any high temperature in the manufacturing process. The first stage of fermentation is evidently alcoholic, the diastase and ferments acting concurrently, until the increased acidity cripples the small amount of amylase present; and the fatty acids in the beer are probably due to lactic ferments, since *Mycoderma aceti* would have reduced the proportion of alcohol. The Matabele boil a mash of sorghum, millet, or maize in large earthen pots. After cooling for 24 hours, and when fermentation has commenced, a quantity of malted sorghum, equal to about one-third of the original raw material, is added, and fermentation proceeds briskly. In three days after boiling, the liquid is strained through hempen bags, and is ready for consumption. The taste is acid and refreshing, something like weak cider. The author has malted sorghum and millet by steeping for three days in a 0.5 per cent. solution of salicylic acid at 25° C. Spread out to a depth of 8—10 cm. between filter paper, the grains begin to "chit" in two days. In nine days the malt is finished, and when dried in the air, crushed, and mixed with water, gives only a very imperfect conversion, even after five days at 60—68° C.—C. S.

Wine Brandies; their Derivation, Adulterations, and Analysis according to "Chemical Functions" by the Paris Municipal Laboratory Method. J. Pharm. Chim. 1904, 19, 484—491 and 593—604. (See also this J. 1903, 435).

SPIRITS may be classified under two heads:—natural alcohols and industrial alcohols. The natural alcohols are distilled from the fermented juices of grapes and other fruits and sugar cane; their character depends on the aromatic "impurities" derived from the plants from which they are prepared. The industrial alcohols are used only in their purified form as "neutral alcohol"; they are obtained from beet-root, potatoes, grain, and other amylaceous materials.

Wine Brandies.—These are produced mainly in the West and South of France; the most famous are those

made in the Charentes district from white wines yielded by grapes of the "Folle blanche" variety, the best being the *Grande Champagne* of the Cognac district. The Charentais stills are of a special type, and the method of distillation is characteristic of the district (see also *loc. cit.*). The brandy "*bonne chauffe*," leaves the stills at an alcoholic strength of 70°; it then undergoes an ageing process for five years in presence of air, during which period its alcoholic strength decreases by volatilisation to about 50°. In other districts of France, brandies are made on a different principle, mainly from grapes of the Picpoul variety. Wine brandies contain all the volatile principles of the grape; the "Folle blanche" grape, especially, is very rich in a perfumed essential oil consisting of ethyl and amyl esters of the higher acids of the fatty series, and a small proportion of hydrocarbons. This oil is also prepared commercially as a "sauce" or Cognac bouquet for aromatising the industrial alcohols. It is prepared by distilling the lees and pips of the grapes with steam; also synthetically from castor oil. The natural brandies also contain volatile by-products [higher alcohols, esters and acids], formed by the action of the yeast and bacteria, also furfural produced during distillation. These latter products are present in very small quantities, and their proportions are always well balanced in a normal spirit. From the oak casks are extracted astringent [tannin], colouring, and aromatic [vanillin] matters. A little cane-sugar is generally added after the ageing period. The proportion and nature of the above "impurities" determine the value of the brandy, and afford a basis for the diagnosis of adulteration. Genuine Cognac, being intensely aromatic, is generally blended with industrial alcohol to an extent depending on the price at which it is to be sold. This adulteration never escapes detection by the Paris method, which is also perfectly certain in the detection of brandies compounded artificially.

Marc Brandies and Mixed Fruit Brandies.—Marc brandies are absolutely toxic on account of the exceptionally heavy proportions of impurities. The methods employed for their distillation vary greatly, and their composition varies correspondingly. Two sorts of marc are treated; the residue remaining after the wine has been racked off is distilled direct, whilst the marc from which the juice has been expressed before fermentation is broken up, treated with water, and fermented before being distilled. Adulteration rarely proceeds beyond blending with neutral alcohol. Artificial marc brandies are always compounded with the "head" products from the distillation of natural mares, which are readily detected by analysis.

—J. F. B.

Alcohol; Denaturing — R. Duchemin. Rev. Gén. de Chin., March, 1904.

AFTER discussing the merits and disadvantages of the various denaturing agents for alcohol which have been proposed, it is concluded that "methylene 90° regie" (a product of wood distillation of sp. gr. 0.830, and containing 65 per cent. of methyl alcohol) is preferable to any other agent hitherto suggested. It is proposed to add 10 per cent. of this product to the alcohol, and it is added that the denaturation could be profitably carried out; the denaturing agent costing about 100 frs. per hectolitre. Other advantages claimed are, that it cannot be separated from the denatured spirit; it does not affect the wicks of alcohol lamps; it possesses a very disagreeable taste without having a very bad odour. It is also pointed out that it would encourage the wood distilling industry.—T. F. B.

Brandy; its Relation to the British Pharmacopœia and Chemical Valuation. J. C. Umney and C. T. Bennett. Chemist and Druggist, 1904, 64, 968—970.

It has recently been decided in law that as brandy is largely used as a medicine, it ought to comply with the definition given in the "B. P.," viz., "a spirituous liquid distilled from wine and matured by age, and containing not less than 86½ per cent. by weight or 43½ per cent. by volume of ethyl hydroxide." It was also recommended that the maximum proportion of esters in brandy should be 80 parts per 100,000 of absolute alcohol. Results obtained by the authors and given in the following table show, however,

that the commercial value of brandy is in no way proportional to the amount of esters it contains.

Description.	Money Value.	Volatile Esters per 100,000 of absolute alcohol.
Splendid old Petite-Cognac champagne, vintage 1875	100	132
A leading Cognac shipper's three star brandy..	50	92
Two-thirds high class Cognac, one-third medium value wine-brandy other than Cognac	50	121
Superior Cognac brandy, vintage 1900	25	94
All pure wine-brandy (75 per cent. Cognac, 25 per cent. other than Cognac)	23	145
Two-thirds high class Cognac brandy, one-third high-class wine-brandy other than Cognac ..	20	81
Medium pure Cognac	20	133
Low-grade pure Cognac	20	106
Half wine brandy, Cognac, half wine brandy other than Cognac	17	92
Low-grade Cognac brandy, vintage 1900	17	72
Half Cognac wine-brandy, low grade, half wine-brandy of other countries, very low grade	15	61
25 per cent. wine brandy, Cognac, 75 per cent. guaranteed (but very low grade) wine-brandy other than Cognac	15	77
33-3 per cent. wine-brandy, Cognac, 33-3 per cent. wine-brandy other than Cognac, 33-3 per cent. grain spirit	10	47
Half low-grade wine-brandies, Cognac, half ditto other than Cognac	10	61
Guaranteed wine brandy of very low grade ...	7	66
All grain spirit flavoured to represent brandy..	5	87
		13

It is pointed out also that it would be very difficult to distinguish between a genuine brandy and one prepared by the addition of blended synthetic esters to a mixture of genuine brandy and so-called "silent" spirit. For judging as to the genuineness of a sample of brandy, it is necessary to make determination of all the "impurities," viz., higher alcohols, aldehydes, acidity and esters.—A. S.

Suspensions or Colloids; Flocculation of, and Agglutination of Bacteria. H. Bechhold. XXIV., page 730.

Glycerin [in Wine]; Determination of — J. Schuch XXIII., page 730.

ENGLISH PATENT.

Distillers' Refuse, Sewage and the like; Treatment of — L. Cameron. Eng. Pat. 14,536, June 30, 1903. XVIII. B., next column.

FRENCH PATENTS.

Mineral Enzymes; Preparation of Artificial — J. Bonnet. Fr. Pat. 339,460, Jan. 9, 1904.

WHEN a solution of a manganese salt is made slightly alkaline in the presence of an organic colloid, capable of preventing the precipitation of the manganese hydroxide, a product is obtained which behaves as a carrier of oxygen in a manner similar to that exerted by an oxidising enzyme. These artificial oxydases are prepared by mixing a solution of an albuminous substance (e.g., white of egg, gelatin, serum, &c.) or of certain colloids (e.g., gums, dextrans, &c.) with a solution of a metallic salt (manganese, iron, copper, &c.) in presence of a small quantity of alkali, alkaline-earth salt, or organic base. The products may be employed either in the de-oxidised state, in the oxidised state, in a state of sterilisation after heating, or in the solid state as obtained by precipitating the solutions by means of alcohol.

—J. F. B.

Fermentation of Liquids. G. Johnson and P. R. Hare. Fr. Pat. 339,613, Jan. 14, 1904. Under Internat. Conv., May 4, 1903.

SEE Eng. Pat. 10,093 of 1903; this J., 1904, 499.—T. F. B.

Dyestuff [and Spirit] from Asphodel Roots. A. Padoil and J. E. Valadon. Fr. Pat. 333,478, Nov. 28, 1903. IV., page 712.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(A).—FOODS.

Coffee Berry; Composition of the Inner Husk of the — B. von Bittó. J. Landw., 1904, 52, 93. Chem.-Zeit., 1904, 28, Rep., 159.

ANALYSIS of the inner husk of the coffee berry (*Coffea arabica*), which contained 11.18 per cent. of moisture, gave the following percentage numbers, calculated on the dry matter:—Ash, 2.96; ethereal extract, 1.29; nitrogenous substances, 6.19; nitrogen-free extractive matters, 23.26; crude fibre, 66.28; crude protein (by Stutzer's method), 4.43. The fat is faint yellow in colour, and when melted only solidifies gradually. On analysis the following results were obtained:—Köttstorfer's (saponification) value, 141.2; acid value, 83.7; free fatty acid, expressed as palmitic acid, 37.84 per cent.; glycerides, as tripalmitin, 28.03 per cent. The husk contains no cholesterol, but gives 0.022 per cent. of organic phosphorus, corresponding with 0.58 of lecithin. The caffeine present amounts to 0.35 per cent. of the dry matter, and the pentosans to 21.50 per cent. The ash is very hygroscopic, and at the ordinary temperature dissolves in water to the extent of 48.59 per cent.—T. H. P.

ENGLISH PATENTS.

Meat Preparations; Manufacture of — A. R. da S. Braga, Sao Paulo, Brazil. Eng. Pat. 7896, April 5, 1904.

A QUANTITY of the fruit of the papaw family (*Carica papaya*), cut into small pieces, is placed in water containing one per 5,000 parts of hydrochloric acid, and after some time the liquid is squeezed out. To this liquid, minced meat is added, and after disaggregation of the fibres, which may be hastened by stirring, has taken place, the mass is dried by heating in a current of air, and pulverised. The proportions of water and fruit vary, according to the quantity of the meat, but the acid must always be used in the smallest possible proportion to facilitate pulverisation. Such a meat preparation, whether powdered or not, is said to keep well.—T. H. P.

(B).—SANITATION; WATER PURIFICATION.

ENGLISH PATENTS.

Sewage; Method and Means for Treating — J. Hewes, Leicester. Eng. Pat. 13,560, June 17, 1903.

THE crude sewage is passed through a small chamber provided with valves into settling-tanks, preferably arranged side by side. The clear liquid passes over a weir at the other end of the tanks into a precipitation tank, where it is treated with suitable chemicals. The sludge from the settling-tanks is allowed to pass into chambers arranged at the side of the tanks, where it is dried. The dry sludge is incinerated in closed retorts, and the products of distillation collected. Lime is added to the incinerated retort residue, and the mixture used as a sewage precipitant or "boiler powder."—W. P. S.

Distillers' Refuse; Sewage and the like; Treatment of — L. Cameron, London. Eng. Pat. 14,536, June 30, 1903.

THE liquid is aerated in a rectangular tank, wherein it is circulated by means of a paddle-wheel. The tank has a partition down its centre, but not extending the whole length of the tank, thus leaving a space vacant at each end. The paddle-wheel is placed in one of the side spaces. When oxidation is complete, the acidity of the liquid is neutralised with lime, and alum is added. After settling, the sludge is removed, mixed with peat, sawdust, or coal dust, and formed into bricks for use as fuel.—W. P. S.

Filter [for Water]; High Pressure — W. S. Rawson, London. Eng. Pat. 12,297, May 29, 1903.

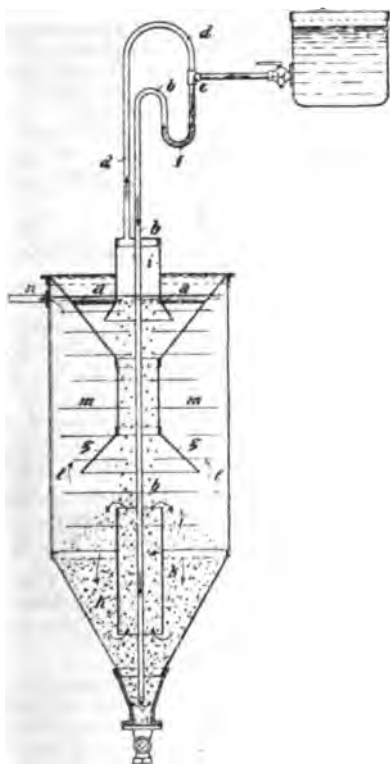
SEE Fr. Pat. 335,676 of 1903; this J., 1904, 265.—T. F. B.

Purified and Sterilised Water, as well as of Distilled Water; Process for the Simultaneous Production of —. A. Baudry, Kieff, Russia. Eng. Pat. 21,668, Oct. 8, 1903.

THE water is passed down a fractionating column, steam being passed in near the bottom. The volatile impurities along with any oily matter in the steam pass away at the top, whilst the solids separated are drawn off at the bottom. The sterilised and purified water is drawn off at an intermediate stage. The steam passing away is sent through a second column, where it is partially condensed, and distilled water is obtained. The rest of the steam along with the volatile impurities serves for a preliminary heating of the water to be treated and then passes away. Should the volatile impurities be valuable they can be recovered by means of a supplementary condenser. The process of drawing off the liquid from an intermediate section of the column can be applied to the separation of mixtures of liquids of different boiling points, such as crude petroleum, &c.—W. H. C.

Rectification of Water; Process and Contrivance for the Solution, with the aid of Compressed Air, of Chemicals for the —. E. Krause, Düsseldorf, Germany. Eng. Pat. 9038, April 20, 1904.

THE cylindrical solution vessel, with a conical bottom and with the internal construction shown, is utilised as follows. The water passes from a store tank through the U-bend *c*, *f*, *b*, at such a rate that it draws air from the pipe *d* with it.



This air then passes to the bottom of the vessel, and in rising, agitates the hydroxide of lime or barium used, and promotes solution. The rising bubbles of air are caught by the inverted funnels *g*, *g* and *i*, and pass up to the pipe *d*, to be used over again. The solution clarifies in rising through the undisturbed portion *m*, *n*, and overflows through *n*. The same air being used over and over again, obviates the difficulties due to the presence of dissolved carbon dioxide, this being absorbed by the lime at the beginning.

—W. H. C.

XIX.—PAPER, PASTEBOARD, Etc.

ENGLISH PATENT.

Sulphates and Carbonates of Lime; Treatment and Utilization [in Paper Manufacture] of Artificial —. A. Monin, Lyons, France. Eng. Pat. 12,391, May 30, 1903.

SEE Fr. Pat. 320,430 of 1902; this J., 1903, 42.—T. F. B.

UNITED STATES PATENTS.

Paper Coating or Enamelling Composition. W. A. Hall, Bellows Falls, Vt., U.S.A. U.S. Pat. 761,374, May 31, 1904.

THE coating composition consists of a solution of casein in alkali, mixed with a solution of modified starch, serving as an adhesive or binder for the enamel base, *e.g.* china clay.
—J. F. B.

Paper Pulp; Manufacturing —. O. Carr, Buenavista, Va., U.S.A. U.S. Pat. 762,139, June 7, 1904.

THE process for extracting tannin and manufacturing paper-pulp from woods containing tannin consists in reducing the wood to chips having a length of fibre sufficient for paper-making and fine enough parallel to their fibres for efficient diffusion. The tannin is then extracted and recovered, and the exhausted chips are converted into pulp.—J. F. B.

FRENCH PATENTS.

Dyestuff [and Fibre for Paper Making] from Asphodel Roots. A. Badoil and J. E. Valadon. Fr. Pat. 333,478, Nov. 28, 1903. IV., page 712.

Rice-Flour; Treatment of —, for Use in Finishing Yarns and Textiles. Soc. Anon. des Rizeries Françaises. Addition, dated Dec. 2, 1903, to Fr. Pat. 384,639, Aug. 1, 1903. (See this J., 1904, 59.)

THIS addition deals with the application of rice-flour, prepared as described in the original specification, to the sizing and smoothing of paper pulp, the couching of paper in white or coloured sheets, leather dressing, the preparation of vegetable gums in the form of paste and generally for all dressings of a similar kind.—T. H. P.

Viscose; Heater for the Treatment of —. Soc. Franc. de la Viscose. Fr. Pat. 339,564, Jan. 18, 1904.

IN the purification of viscose, by heating it at a definite temperature for a certain time until it coagulates and becomes insoluble in the saline washing liquids employed for extracting the by-products, it is essential that every portion of the mass should be continuously subjected to an invariable temperature. The apparatus in which this treatment is effected consists of a hemispherical vessel surrounded by a water-bath which is heated by a steam coil. In the vessel is mounted a vertical shaft carrying three superposed stirring arms provided with scrapers, and designed in such a way that the mass, as it coagulates, is reduced to fine granules. The water in the water-bath is likewise agitated mechanically in order to ensure uniform distribution of the heat. The saline solution is introduced just before the mass coagulates.—J. F. B.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Chloroform; Preservation of —. Témoin. Chem. and Druggist, 1904, 64, 973.

THE author states that chloroform to which 0.4 per cent. of sulphur has been added, undergoes no alteration on keeping, even when exposed to light.—A. S.

Bromoform; Electrolytic Preparation of —. E. Müller and R. Loebe. Z. Elektrochem., 1904, 10, 409—415.

THE authors have improved upon the method of Coughlin (this J., 1902, 186) in dispensing with a porous septum. The most favourable composition of the electrolyte is

125 grms. of potassium bromide, 375 c.c. of water, 50 c.c. of acetone, 5 grms. of potassium bicarbonate, and 1 grm. of potassium chromate. The latter ingredient serves to inhibit cathodic reduction. A good current-efficiency (90—95 per cent.) can only be secured by allowing free bromine to separate out with the bromoform, and to this end a plentiful supply of carbon dioxide is bubbled through the liquid during electrolysis.—W. A. C.

Guaiacol with Lead Peroxide; Distillation of — R. Pschorr and M. Silberbach. Ber., 1904, 37, 2149—2152.

WHEN phenol is distilled with lead peroxide, diphenylene oxide is produced. The authors have found, however, that when guaiacol is subjected to the same treatment it is converted into veratrol, with the simultaneous formation of catechol (pyrocatechin), the bulk of which remains behind in the form of the lead salt and is carbonised, whilst the veratrol distils over. The lead peroxide acts in this case merely as a base, and the same reaction takes place on the distillation of the sodium salt of guaiacol, but with a smaller yield. By an analogous process the lead salt of ethyl vanillate yielded the corresponding ester of veratric acid, and the lead salt of the monomethyl ether of resorcinol yielded the dimethyl ether on distillation.—J. F. B.

Lupinidine and Spartefine. R. Willstätter and W. Marx. Ber., 1904, 37, 2351—2357.

IN 1860, Liebscher isolated from the seeds of the yellow lupin two alkaloids—the crystalline oxygenated lupinine and the liquid, oxygen-free lupinidine to which the formula, $C_{15}H_{25}N$ was assigned. The authors have prepared the latter base from the mother-liquors after the separation of the lupinine. From their analyses of the pure alkaloid they conclude that the above formula is erroneous, and that lupinidine has a composition corresponding to the formula $C_{15}H_{25}N_2$. They also find that lupinidine is identical with the alkaloid spartefine isolated by Stenhouse in 1851 from the broom tree. The alkaloids occurring in the various species of lupin are as follows:—Lupinine, $C_{10}H_{19}ON$, in *Lupinus luteus* and *L. niger*. Spartefine, $C_{15}H_{25}N_2$, in *L. luteus* and *L. niger*. Lupanine, $C_{11}H_{21}ON_2$ [racemic and laevorotatory forms] in *L. albus*, *L. angustifolius* [blue lupin], and *L. perennis*.—J. F. B.

Orange Flower; Distribution of Certain Organic Matters in the — E. Charabot and G. Laloue. Comptes rend., 1904, 138, 1513—1514.

THE greater portion of the essential oil of the orange flower is located in the petals, which also contain the highest percentage of oil. During the period of blossoming the percentage of oil in the flower and the weight of oil contained in a single flower increase considerably; the formation or accumulation of the odorous substances in the flower is most intense when that organ is in the stage of full development. During the development of the blossom the essential oil becomes richer in terpenic esters, methyl anthranilate, and total alcohol; the esterification continues in the blossom, but with far less intensity than in the leaf and stem. The proportion of geraniol in the oil increases during blossoming, whilst that of the linalool decreases. In the full-blown flowers there is no marked difference in composition between the oil extracted from the petals and that obtained from the other parts of the blossom, but the former is slightly richer in methyl anthranilate than the latter.—J. F. B.

Camphor Group; Investigations in the — J. W. Brühl. Ber., 1904, 37, 2156—2178.

A CONTRIBUTION to the study of the simplest substitution compounds of camphor, especially the halogen derivatives, their synthesis and orientation. A comparison is drawn between the action of bromine and iodine on oxymethylene-camphor in presence of an excess of alkali. The first product in either case is bromo- or iodo-formyl-camphor, but the bromo-formyl-camphor is less stable in presence of excess of alkali than the iodo derivative. The former breaks down with the production of *o*-mono-bromo-camphor

and alkali formate, and addition of more bromine has no further effect; the iodo-formyl-camphor, on the other hand, resists the action of the alkali and yields *o*-*o*-diiodo-camphor when the equivalent quantity of iodine is added, no trace of the mono-iodo-camphor being produced.

—J. F. B.

Camphor Derivatives; Physiological Action of Certain — J. W. Brühl. Ber., 1904, 37, 2178—2183.

CAMPHOCARBOXYLIC acid is practically devoid of physiological properties, but the action of its esters in an homologous series resembles that of camphor, and increases in inverse proportion to their solubility in alkali (see this J., 1902, 1409). The present paper deals with the action of the homologous series of oxymethylene-camphor [acylcamphors]. The lowest member, oxymethylene-camphor, is readily soluble in an equivalent quantity of alkali; the sodium salt is poisonous in a general manner, but it is totally devoid of the specific properties of camphor, and is to be classed with camphocarboxylic acid. It possesses a feeble bactericidal action. The solubility of the next members of the series in alkali decreases with increase of the molecular weight, and these bodies are comparable with the esters of camphocarboxylic acid. Like the latter, oxymethylene-camphor and oxymethylene-camphor, possess the specific toxic properties of camphor. They are nerve poisons, and set up the typical "cramping" actions; they take effect more rapidly than camphor. Oxymethylene-camphor is the more powerful of the two. Mono- and di-iodo-camphor were tested for their antiseptic properties, both being odourless bodies. Mono-iodo-camphor acts as an irritant towards the more sensitive mucous membranes, but its antiseptic power is only slight. Di-iodo-camphor is more powerfully irritant, and cannot be used on open wounds; it might possibly be of value when an initial irritant and a secondary resorbent action is required.—J. F. B.

Oralacetic Ester; Product of Spontaneous Decomposition of [Detection of] — L. J. Simon. XXIII., page 730.

"*Mangifera Indica*," L. [*Mango Tree*]; The Gum of — P. Lemeland. XVI., page 721.

ENGLISH PATENT.

3,4-Diamidobenzoic Acid; Manufacture of Alkyl Esters of — O. Imray, London. From E. Ritsert, Frankfurt-on-Maine, Germany. Eng. Pat. 16,684, July 29, 1903.

SEE U.S. Pat. 761,998 of 1904; following this.—T. F. B.

UNITED STATES PATENTS.

Halogen Tertiary Butyl Alcohol; Process of Making — T. B. Aldrich, Detroit, Mich., U.S.A. U.S. Pat. 761,188, May 31, 1904.

A KETONE, or a mixture of ketones such as is produced by dry distillation of salts of monobasic fatty acids, is halogenised (e.g., with a hypochlorite) in such a way as to produce a mixture of about equimolecular parts of free ketone and substitution product, which is then condensed to form tri-halogenated tertiary butyl alcohol. Thus, trichlorotertiary-butyl alcohol is produced by treating acetone with bleaching powder in presence of water, and condensing the product with alkali hydroxide.—T. F. B.

Halogen Tertiary Butyl Alcohol; Process of Making — T. B. Aldrich, Detroit, Mich., U.S.A. U.S. Pat. 761,189, May 31, 1904.

A KETONE and a halogen substitution derivative thereof is condensed, by means of less than 10 per cent. of alkali hydroxide, to a halogenated tertiary butyl alcohol. By condensing a mixture of acetone and bromoform with less than 10 per cent. of sodium hydroxide, distilling the mixture under reduced pressure to remove the excess of acetone and bromoform, and then distilling the residue with steam, tribromotertiary butyl alcohol is produced.—T. F. B.

3.4-Diaminobenzoic Acid; Alkyl Esters of —, and Process of Making same. E. Ritsert and W. Epstein, Frankfurt, Assignors to Farbwerke vorm. Meister, Lucius, und Brüning, Hoechst on the Main, Germany. U.S. Pat. 761,998, June 7, 1904.

p (4)-Aminobenzoic acid is esterified, and an acidyl group introduced, and the acidyl compound then nitrated, 3-nitro-4-acidylaminobenzoic ester resulting; the acidyl group is eliminated and the product reduced, 3,4-diaminobenzoic esters being produced as white, easily crystallised substances, fairly easily soluble in water, and readily soluble in alcohol and in ether.—T. F. B.

Licorice Root; Process for Extracting Juice from Dried —. F. Evers, Düsseldorf, Germany. U.S. Pat. 762,032, June 7, 1904.

See Eng. Pat. 1180 of 1904; this J., 1904, 383.—T. F. B.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Cyanine Dyestuffs; Constitution of —. A. Miethe and G. Book. IV., page 712.

FRENCH PATENT.

Pigment [Photographic] Process; Film for the —. Act.-Ges. f. Anilinfabr. Fr. Pat. 339,654, Jan. 16, 1904.

CELLULOID or collodion is incorporated with oils, fats, waxes, resins, high boiling-point hydrocarbons, &c., and formed into sheets, which are covered with a film of pigmented gelatin in the usual manner. For example, 10 kilos. of celluloid and 609 grms. of castor oil are mixed together in presence of alcohol, acetone, &c., and formed into sheets. Photographs produced by this method, when stripped from their celluloid backing and fixed to paper, do not present the excessive glossiness exhibited by prints produced on prepared celluloid.—T. F. B.

XXII.—EXPLOSIVES, MATCHES, Etc.

Explosives; Twenty-eighth Annual Report of His Majesty's Inspector of —. 1903.

THERE have been no modifications of the law during the year. The number of deaths (5) from accidents by fire or explosion in the manufacture of explosives was below the average for the decade (6.4). The total number of factories under continuing certificate or license is 147. The quantity of foreign blasting explosives imported during the past two years was as follows:—

	1902.	1903.
	Lb.	Lb.
Nitroglycerin explosives.....	1,839,277	2,330,582
Other explosives.....	12,000	168 + 2 cases

Of the above 2,330,582 lb. of nitroglycerin explosives imported during 1903, however, 1,460,000 lb. were transhipped from British ports for other countries. The number of detonators imported during the year was over 17 millions, of which more than 4 millions were transhipped for other countries. Dr. Dupré's report shows that of 379 samples of licensed explosives examined by him, 339 were passed and 49 rejected. He has continued his work on the sensitiveness of nitroglycerin to shock. When placed between sheets of lead it does not explode when struck by a 2 lb. weight falling from a height of 46 inches. Sheet lead of even 0.01 inch thickness greatly reduces its liability to explosion. Picric acid, on the other hand, when placed upon a steel anvil could not be exploded by a blow from a 2 lb. weight falling from a height of 46 inches. When thin sheet lead (0.01 inch) was placed upon the anvil and the picric acid put on this, a blow from a 2 lb. weight falling from a height of only

18 inches readily exploded it. An investigation was made as to the effects of heat, of acids, and of alkalis on trinitrotoluene and Aniline Black. The former, when heated, takes fire at about the temperature at which gunpowder explodes. The latter has to be heated to dull redness before it fires. A mixture of the two substances, however, takes fire at a temperature lower than either of its constituents separately. The addition of sulphuric acid or of solid caustic potash to trinitrotoluene just melted over a steam bath produced no appreciable rise of temperature. Should, however, the trinitrotoluene be raised to 160° C. the addition of caustic potash produced instant ignition and sometimes an explosion. Two new tests are described for investigating the stability of nitro explosives. The first consists in heating from 2—2.5 grms. of dry gun-cotton, contained in small weighing bottles, to a temperature of 130° C. Two equal portions are heated for half an hour, the bottles fitting fairly well into copper tubes immersed in an oil-bath. After weighing, the bottles are replaced in the bath and again heated and weighed, one after the lapse of 2 hours, the other after 4 hours. The loss in weight will, it is anticipated, give a measure of the stability of the explosive. In the second test the explosive (2—2.5 grms.) is introduced into a glass tube, 12 ins. long, 0.6 ins. diameter, and of about 50 c.c. capacity. This tube is connected with a receiver kept exhausted to 1 m.m. of mercury, and also with a barometer tube dipping into mercury. After the tube containing the explosive has been exhausted it is placed in an oil-bath at 130° C. The mercury in the barometer tube soon begins to fall, and after the lapse of $\frac{1}{4}$ hour the vacuum is restored. This process is repeated after the lapse of another $\frac{1}{4}$ hour. The results of the first half hour, though noted, are usually not included in the subsequent records. After this, however, the real test begins, and the number of mm. the mercury falls every $\frac{1}{4}$ or $\frac{1}{2}$ hour is recorded, the vacuum being restored after each observation. The time allowed to elapse between the observations is governed by the amount of gas evolved, the object being to retain a moderate vacuum (from 1/100—1/50 of an atmosphere) throughout the experiment. By a simple cooling arrangement applied to the upper part of the heating tube, any nitroglycerin in the explosive is condensed, and the test is thus applicable to nitroglycerin explosives.

Captain Desborough's report on the Testing Station, Woolwich, shows that out of 22 explosives submitted, 13 successfully passed the test. A gas-leak detector has been added to the gallery in order to locate the actual places at which leakage occurs, and it has also been useful in detecting the presence of unconsumed coal-gas after a shot has been fired in which there has been doubt as to ignition. The only new departure in explosives has been the combination of nitroglycerin with ammonium nitrate. The only notable change with accessories has been the substitution of a waxed for an ordinary paper wrapper in a non-detonating explosive, and it was found that the wax-coated explosive was much less sensitive to ignition from an external spark. Experiments were carried out as to the physical effect produced on ammonium nitrate explosives by subjecting them to extreme cold—in surrounding the cartridges with solid carbon dioxide for 12 hours. The results obtained, showed that when the explosive was contained in a paper wrapper it became so hard as to render the insertion of a detonator impossible, whereas the samples contained in metal wrappers did not change their physical condition. From experiments carried out the conclusion is drawn that the visibility of sparks or glow on firing an explosive in a bore-hole is not of necessity any criterion as to the liability to fire gas, but the appearance of flame (as opposed to glow) or of sparks due to the combustion of projected explosive indicates the existence of a very grave danger.—G. W. McD.

Explosion of Gunpowder; Circumstances attending an —, which occurred in the Mixing House of the Factory of Messrs. Curtis and Harvey, Ltd., at the Marsh, Faversham, on Feb. 2, 1904. By Capt. M. B. Lloyd, H.M. Inspector of Explosives.

800 lb. of roughly mixed powder exploded in the mixing machine. It is considered that "the explosion was most probably caused by a foreign substance introduced into the ingredients in course of being mixed in the machine, and

that this was most likely to have been a small piece of cement from the lining of the wall which was detached from a faulty place." The possibility of lubricating oil, in the present case, olive oil, in contact with ground charcoal having caused spontaneous ignition of the charcoal was investigated. Two thermometers, one clean and one oiled with the olive oil, were placed in charcoal contained in cardboard cylinders surrounded with cotton wool, but no increase of temperature could be detected.—G. W. McD.

Explosion of Nitroglycerin; Circumstances attending an —, in the Separating House of the Factory of Messrs. Curtis and Harvey, Ltd., at Cliffe, Kent, on Feb. 18, 1904. By Major A. Cooper-Key, H.M. Inspector of Explosives.

ABOUT 2,000 lb. of nitroglycerin were in the house at the time, and dense nitrous fumes were noticed coming from the building for some seconds before the explosion took place. It is considered probable "that the accident was caused by the spontaneous decomposition of the charge of nitroglycerin in course of separation owing to the presence in one of the ingredients of an impurity undiscoverable by the analysis of a sample, and that the fatal results were due to the men in charge failing to make use of the drowning tank until the heat from the decomposition caused an explosion." Experiments showed that the gases evolved in the "fuming off" of nitroglycerin consisted of nitrogen trioxide and peroxide (48.7 per cent.), nitric oxide (40.7 per cent.), carbon monoxide (3.2 per cent.), carbon dioxide (1.4 per cent.), and nitrogen (6 per cent.), and Major Cooper-Key considers that the failure to drown the charge was not due to the workmen being instantaneously and unexpectedly overcome by the carbon monoxide in the fumes. It is recommended that arrangements should be made in nitroglycerin works to enable a charge to be drowned in a period measured by seconds instead of by minutes.—G. W. McD.

UNITED STATES PATENT.

Gunpowder. A. H. Robinette, Fostoria, Ohio, U.S.A. U.S. Pat. 761,403, May 31, 1904.

"AN explosive powder, consisting of nitrate of potash, ferrocyanide of potash, chlorate of potash, yellow prussiate of potash, and granulated sugar.—C. A. M.

Explosive Cartridge. G. Cornara, Mantova, Italy. U.S. Pat. 762,229, June 7, 1904.

SEE Eng. Pat. 30,253 of 1898; this J., 1899, 175.—T. F. R.

Explosive Compound. W. A. Spore, Argenta, Ill., U.S.A. U.S. Pat. 762,446, June 14, 1904.

THE explosive consists of corn-pith, potassium chlorate, and a nitrated-turpentine binding material.—G. W. McD.

Explosive, and Method of Making same. E. Steele, Mill Valley, Cal., U.S.A. U.S. Pat. 762,447, June 14, 1904.

SEE Fr. Pat. 336,783 of 1903; this J., 1904, 386.—T. F. B.

Nitrocellulose; Art of Purifying —. F. I. du Pont, Wilmington, U.S.A. U.S. Pat. 762,757, June 14, 1904.

NITROCELLULOSE is immersed in water, and is subsequently brought in contact with a further amount of water containing a gas in solution, under pressure, in such a manner that the escaping gas passes through the nitrocellulose.

—G. W. McD.

FRENCH PATENT.

Explosive. J. Bühner. Fr. Pat. 339,552, Jan. 13, 1904.

PARAFFIN (6 parts) is heated to 65° C., and mononitrotoluene (7 parts) is dissolved in it at this temperature. Trinitrotoluene (1 part), iron filings (16 parts), and potassium chlorate (70 parts), are then added successively, and incorporated at a temperature of 55° C. Other metals, in a fine state of division, such as copper, zinc, &c., may be used in place of iron.—G. W. McD.

XXIII.—ANALYTICAL CHEMISTRY.

APPARATUS, ETC.

Soapstone Fibres. K. E. Guthe. *Nature*, 1904, 70, 132; *Pharm. J.*, 1904, 72, 852.

IF steatite or soapstone be fused in a gas-oxygen jet, a clear bead is obtained from which very fine fibres can easily be drawn. These fibres show approximately the same elastic fatigue and tensile strength as fused quartz fibres of the same dimensions, and can be used instead of the latter for suspensions.—A. S.

INORGANIC—QUALITATIVE.

Indium [Separation from Aluminium]. C. Renz. *Ber.*, 1904, 37, 2110—2112.

THE author draws attention, in view of recent publications, to his former work on indium. Indium chloride in solution in absolute alcohol gives, with pyridine, a crystalline precipitate of $\text{InCl}_3 \cdot 3\text{C}_5\text{H}_5\text{N}$, slightly soluble in alcohol, insoluble in ether, melting at 253° C. Indium hydroxide, in presence of a little ethylamine hydrochloride, is insoluble in ethylamine (the presence of the hydrochloride prevents the hydroxide from passing through a filter), and this insolubility can be used to separate indium from aluminium. In ammonia, however, indium hydroxide is somewhat soluble. The author first described the preparation of crystallised indium oxide and its volatility at high temperatures. When heated strongly in an iridium capsule, it sublimes perceptibly without previous fusion, and the residue contains brilliant minute crystals belonging to the regular system, as well as crystals of another shape. Possibly the two are In_2O_3 and In_4O_7 , corresponding to Fe_2O_3 and Fe_3O_4 . The crystalline form of In_2O_3 is distinguished from the amorphous by being quite insoluble in hot concentrated sulphuric acid. Metallic indium combines readily with selenium and tellurium.—J. T. D.

INORGANIC—QUANTITATIVE.

Prussian Blue in Spent Oxide, &c.; Determination of — by Feld's Method. R. Witzeck. *J. Gasbeleucht.*, 1904, 47, 545—547.

THE author confirms Feld's observation that methods for the determination of Prussian blue, in which the crude cyanide material is first decomposed by heating with a solution of caustic alkali, give results which are too low, on account of the formation of thiocyanate. Feld (this J., 1903, 1068) has described processes which are applicable to the examination of such materials. These methods have been largely used by the author, and are recommended as accurate and rapid. The formation of thiocyanate is entirely avoided. The author uses a simple distillation apparatus, the distillation flask being furnished with a tap-funnel and the main receiver connected by a safety bulb-tube. For determining the total cyanogen content, 2 grms. of the sample of spent oxide (or 0.5 gm. in the case of cyanide mud) are rubbed down finely with 1 c.c. of N/1 ferrous sulphate solution and 5 c.c. of 8N sodium hydroxide solution for five minutes. 30 c.c. of 3N magnesium chloride solution are then added slowly, with continuous stirring, and the whole is washed into the distillation flask (which is of 700 c.c. capacity), with enough hot water to bring the volume to about 200 c.c. After five minutes' boiling, 100 c.c. of boiling N/10 mercuric chloride solution are added to the boiling liquid, and the mixture is boiled 10 minutes longer. All the cyanogen present is now in the form of mercuric cyanide. The flask is attached to the condenser, 30 c.c. of 4N sulphuric acid are added, and the liquid is distilled for 20—30 minutes, the receiver and bulb containing 20 c.c. of 2N sodium hydroxide solution. If the distillate be turbid, owing to the presence of sulphur, about 5 gm. of lead carbonate is added, the liquid is agitated, filtered, and an aliquot portion taken for titration. The titration is performed by adding 5 c.c. of 4N potassium iodide solution and then N/10 silver nitrate solution, until a yellow

appears. 1 c.c. of N/10 silver nitrate solution = 0.009556 gm. of Prussian blue ($\text{Fe}_7\text{Cy}_{18}$). The whole analysis takes about $1\frac{1}{2}$ hours.—H. B.

Calcium; Separation of — from Magnesium. C. Stoberg. *Z. angew. Chem.*, 1904, 17, 741—744 and 769—771.

A CRITICAL bibliography is given of the methods of separation of calcium and magnesium which have been more or less widely adopted, and experiments are quoted which show that the almost universal oxalate method gives accurate results, provided that:—(1) The solutions are sufficiently diluted; (2) a sufficient quantity of ammonium chloride is present; (3) the precipitation is effected at the boiling temperature, and a large excess of ammonium oxalate is used; (4) the precipitate is allowed to stand for 12 hours before filtering; (5) the precipitate is redissolved in hydrochloric acid and reprecipitated in the same manner as at first. The time required for this method, however, induced the author to investigate the method based on the different solubilities of the sulphates in alcohol; and after many attempts with ethyl alcohol of various strengths, and with mixtures of methyl and ethyl alcohols, the following method was adopted:—The mixed salts, in not too dilute solution, are evaporated with excess of sulphuric acid and the whole of the excess of sulphuric acid is driven off by careful heating. The sulphates are digested on the water-bath with water more than enough to convert the magnesium sulphate into the hydrated salt $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$, and when this is complete, methyl alcohol, to which has been added 10 per cent. by volume of absolute ethyl alcohol, is added, in quantity sufficient to dissolve the magnesium sulphate. After a few minutes the whole is filtered, and the filter thoroughly washed with a mixture of 5 volumes of absolute alcohol and 95 volumes of methyl alcohol. The magnesium sulphate is completely dissolved; whilst the calcium sulphate remains absolutely insoluble. The filter is dried at 105°C ., separately incinerated, the ash ignited with 2–3 drops of sulphuric acid, the precipitate added, ignited, and weighed. The filtrate is diluted with water (to prevent separation of difficultly soluble lower hydrates, which is apt to occur if the alcohol be at once evaporated), heated on the water-bath till the alcohol is all driven off, and the magnesia either determined as pyrophosphate or calculated from the determination of the sulphuric acid as barium sulphate. The results are accurate, and a calcium determination can be easily carried out in an hour.—J. T. D.

Mercury; Separation of — from Molybdenum and Tungsten, by means of Hydrazine. P. Jannasch and W. Bettges. *Ber.*, 1904, 37, 2219—2228.

From Molybdenum.—To the solution contained in a deep porcelain basin add 2–3 grms. of tartaric or citric acid, and make up to about 100 c.c. Heat the covered basin to about 80°C ., add 2 grms. of hydrazine sulphate dissolved in 30–45 c.c. of strong ammonia, and heat for 15 minutes, stirring frequently. Pour off through a double filter, wash by decantation with a solution of 1 gm. of hydrazine sulphate in 100 c.c. of water to which 20 c.c. of strong ammonia have been added, and determine the mercury in the filtrate. Collect the precipitate on the filter, add 60 c.c. of strong ammonium sulphide solution, keep warm till the colour changes from yellow to red, and cautiously add excess of hydrochloric acid; heat, with stirring, for 10–15 minutes on the water-bath, filter, wash with water containing hydrochloric acid and hydrogen sulphide, dry; separately incinerate the filter at a low temperature in a porcelain crucible with perforated lid, add the precipitate, place the crucible in a nickel dish, and ignite in a stream of oxygen till the sulphide is completely converted into trioxide.

From Tungsten.—Proceed, for the mercury, exactly as above, save that the addition of tartaric or citric acid is not necessary. Boil down the filtrate to 50 c.c., add, very cautiously, fuming nitric acid till the hydrazine is destroyed, boil down, transfer to a weighed porcelain crucible, complete the evaporation to dryness, heat in an air-bath, and then to redness over a flame, and weigh. This method is

obviously available only when the filtrate from the mercury contains no fixed substance other than tungstic acid. Attempts to determine tungsten in tungstates by precipitation as sulphide, or as tungstic acid or anhydride by direct precipitation with acids, all failed. With the aid of hydrazine, however, the latter mode of precipitation was made quantitatively accurate. The tungstate is dissolved in about 50 c.c. of water, heated to boiling, and a mixture of 2 grms. of hydrazine hydrochloride dissolved in 10 c.c. of water with 25 c.c. of concentrated hydrochloric acid, is added. (The acid may be added first and the hydrazine solution immediately after, but the hydrazine must not be added before the acid.) A precipitate forms, at first, whitish, but gradually becoming deep yellow, citron-yellow, and green. The liquid is gently boiled, with frequent stirring, for 20–25 minutes, and evaporated to about half its bulk. The precipitate is allowed to settle, poured through a double filter (putting back any turbid filtrate till quite clear), washed thoroughly with 1:10 nitric acid, the filter and moist precipitate ignited in a porcelain crucible, and the residue moistened with a few drops of nitric acid, and again ignited till constant in weight.—J. T. D.

Palladium; Determination of — and Separation from other Metals by Means of Hydrazine. P. Jannasch and W. Bettges. *Ber.*, 1904, 37, 2210—2219.

PURE palladium was prepared from the commercial metal by dissolving in nitrohydrochloric acid, evaporating to dryness, taking up with water and hydrochloric acid, diluting considerably, and precipitating at the boiling temperature with hydrazine sulphate. After digesting at 100°C . for some time, the precipitate was filtered off, dried and ignited. This precipitate, however, contained copper (which was removed by a repetition of the process) and oxygen, the latter in variable amount, corresponding in some instances with Pd_2O . By ignition in hydrogen the oxygen is removed, and pure silver-grey metallic palladium obtained. For the determination of palladium, 0.3–0.5 gm. of the pure metal is dissolved in *aqua regia*, the solution evaporated, and the residue taken up with a little water, and 20 drops of dilute hydrochloric acid, heated till solution is complete, diluted to 120 c.c., and heated to boiling. The solution of 1 gm. of hydrazine sulphate in 20 c.c. of water is added, the liquid heated on the water bath for 20 minutes, allowed to stand in the cold for two hours, filtered through asbestos in a hard-glass tube, the precipitate well washed with hot water, dried at 120° – 180°C ., and ignited in hydrogen. When water ceases to be formed, the hydrogen stream is stopped, and the palladium allowed to cool in the desiccator and weighed.

Separation from Potassium or Sodium.—Proceed exactly as above. Boil down the filtrate to 50 c.c., add cautiously a few c.c. of fuming nitric acid to destroy the hydrazine, evaporate to dryness, take up with a little dilute sulphuric acid, and evaporate, weighing the potassium or sodium as sulphate.

Separation from Magnesium or Zinc.—The palladium is determined as above. The magnesium or zinc can be precipitated directly by means of sodium phosphate and ammonia or sodium carbonate respectively, without removing the hydrazine.

Separation from Iron.—Determine palladium as above. Destroy the hydrazine, and precipitate the iron with ammonia.—J. T. D.

Chromic Oxide in Chrome Leather; Note on the Determination of — and Separation of the Same from Aluminium Oxide in the Presence of Aluminium Salts. H. R. Procter. *Collegium*, 1904, 192.

THE Procter and Griffith method of fusing the ash from chrome leather with a mixture of sodium carbonate and *magnesia levis* (this *Journal*, 1900, 223) has been thoroughly confirmed as regards accuracy, and for convenience and rapidity leaves little to be desired. Should aluminium be present it is perfectly easy to reduce the solution with alcohol, weigh the mixed oxides, and deduct the weight of chromium calculated from titration as stated by Appelius (this *Journal*, 1904, 552); or precipitate the aluminium as

once from the acid solution by ammonia and ammonium chloride, with the usual precautions to avoid precipitation of chromic acid.—R. L. J.

ORGANIC—QUALITATIVE.

Indophenine Reaction. L. Storch. Ber., 1904, 37, 1961.

THE effect of oxidising agents in promoting this reaction for thiophene (blue coloration with isatin and pure sulphuric acid) seems to be solely due to the heat developed. The same effect is produced by adding water or by simply warming the mixture without addition of water.—K. F.

Oxalacetic Ester; Product of Spontaneous Decomposition of — [Detection of]. L. J. Simon. Comptes rend., 1904, 138, 1505–1508.

Oxalacetic ester on keeping undergoes spontaneously a change, resulting, in the probable formation of a dihydroxy-quinonic derivative. Such a sample gives with alkalis a deep violet coloration, which deepens gradually, and is destroyed by excess of the reagent. The same coloration can be obtained at once by substituting alkali borate or formate for the hydroxide, and the solution can then be boiled with excess of the reagent without fear of destroying the colour. This reaction may be used to identify oxalacetic ester.—J. T. D.

ORGANIC—QUANTITATIVE.

Tannin Determination; [Filtration of Quebracho and Mangrove Extracts]. K. Schorlemmer. Collegium, 1904, 137–144.

Two litres each of various quebracho and mangrove extracts were prepared as for analysis by the method of the

Internat. Assoc. of Leather Trades Chemists, halved into portions A and B, and the times occupied in filtering the various fractions recorded (see table). The chief points of interest were (a) the length of time, usually several hours, required to filter a quantity of those apparently clear liquids through the "S. and S. No. 605 hard" paper and (b) the irregular behaviour, with these materials, of these papers, though they were all taken from one and the same packet. The 500 c.c. fractions, less 50 c.c. removed to determine the contents, were passed each through a second filter II. A. or II. B., as in the method for finding the "correction factor of the filter-paper," and here the time required was usually a matter of minutes. In the first filtration, substances are removed which, even after the factor has been applied, represent appreciable percentages of insoluble matters (see last col. in table), although, with two exceptions, all the liquors appeared too clear to require filtration. Four different values for insoluble matter were obtained from one and the same extract (Expts. No. 8 and 9), as the result of four trials *viz.*, 8.A., 8.B., 9.A., 9.B. In four instances weighed filter papers were employed and the dried deposits, after removal of soluble matter by washing, determined by difference. The weights so obtained bore a definite relation to the times required to filter, being greater as the latter were longer. The value of applying a correction factor in the analysis of these materials would appear to be small because (1) filtered and unfiltered liquors behave differently towards the papers and (2) the papers themselves show large differences in behaviour. The percentage of total soluble matter determined by evaporating 50 c.c. from filtrate (b) was in most cases identical (occasionally higher) with the result deduced from filtrate (a) plus the correction factor. In the table the figures in brackets are differences (losses) in mgrms. per 50 c.c. from the contents of 50 c.c. of original unfiltered liquor. In other words, the losses in filtrate (b) are almost the same as the losses in filtrate (a)

Table showing the times required to filter (in hours) and refilter (in minutes) Quebracho and Mangrove Liquors.

	Filter I.					Filter II.		(6) Correction Factor (b - c). + mgrms.	(7) "Insoluble Matter." Per Cent.
	(1) First 250 c.c. Hours.	(2) Next 50 c.c. Filtrate (a).		(3) Next 500 c.c. Filtrate (b).		(4) First 250 c.c. Mins.	(5) Next 50 c.c. Filtrate c. Mins.		
		Hours.	Loss in Mgrms.	Hours.	Loss in Mgrms.				
1. Quebracho extract { A	3.5	2.0	5	26.0	2	30	8	3	0.26
"soluble"..... { B	0.5	10 mins.	6	7.0	4	40	15	2	0.23
2. Quebracho extract { A	2.25	1.2	4	36.0	4	150	102	2	0.33
"soluble"..... { B	2.5	1.7	3	36.5	4	60	40	3	0.0
3. Quebracho liquid { A	3.5	2.2	12	25.0	7	35	5	5	1.16
extract "soluble" { B	3.5	2.5	12	26.0	8	45	10	5	1.16
4. Quebracho extract { A	14.0	5.0	16	26.0*	13	40*	30	3	2.36
"soluble"..... { B	13.0	4.2	11	27.5*	14	5	2	0	2.00
5. Quebracho extract { A	8.0	4.0	2	36.0	0	3	1	0	0.27
"soluble"..... { B	42 mins.	1 min.	4	15 mins.	2	3	1	0	0.53
6. "R. Catechu," li- { A	3.5	1.5	12	26.0	11	60	5	3	1.72
quid..... { B	5.7	1.7	14	29.7	11	30	1	1	2.45
7. "Mimosa D."..... { A	1.7	0.8	7	30.7	6	55	15	1	1.18
"soluble"..... { B	2.2	2.0	9	35.5	7	60	20	4	1.00
8. Mangrove extract. { A	7.0	2.5	6	36.5	4	120	60	4	0.36
"soluble"..... { B	7.0	2.5	6	40.5	5	90	45	5	0.18
9. Mangrove extract { A	1.0	0.7	8	13.0	7	40	8	2	1.00
same as No. 8.... { B	8.0	3.0	12	36.0	8	40	5	1	2.00

* Only part of the required amount filtered in this time.

after correction by the plus amount due to the factor, so that equally true results might be obtained more simply by rejecting a larger quantity of filtrate, say 400 c.c., than at present customary, before collecting for evaporation.

—R. L. J.

Glycerin [in Wine]; Determination of — by the Lime and by the Iodide Method. J. Schuch. Z. landw. Versuchsw. in Oesterr., 1904, 7, 111. Chem.-Zeit., 1904, 28, Rep. 158.

THE differences, expressed in grams of glycerin per litre of wine, between the results obtained by the lime method and by the iodide method of Zeisel and Fanto, are stated as follows: —For white wines, —0.35 to +0.20; for red wines, —0.51 to +0.77; for sweet wines, —1.21 to +1.21. These differences, even in the case of sweet wines, are not sufficiently great to cause the lime method to be replaced,

especially as the glycerin obtained by the iodide process can only be regarded as "crude glycerin." The lime method has the advantage of allowing a number of determinations to be carried on simultaneously, without delaying the other determinations of a wine analysis. To do this with the iodide method necessitates the use of a number of expensive pieces of apparatus.—T. H. P.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Suspensions or Colloids; Flocculation of —, and Agglutination of Bacteria. H. Bechhold. Z. physik. Chem., 1904, 48, 385–423. (See also this J., 1904, 688.)

THE author's experiments related to:—(1) The flocculation by various electrolytes of suspensions of mastic, bacteria

(chiefly typhus bacteria cultivated on bouillon, killed with "formol" and washed in a centrifugal apparatus with distilled water) and agglutinin-bacteria (typhus bacteria treated with the serum of a goat which had been inoculated with typhus bacteria); and (2) the influence of various colloids of the first order (gelatin, serum, gum arabic, &c.) on the action of the electrolytes. The results may be summarised as follows:—Below a certain concentration of the electrolyte and of the suspension, no flocculation takes place even on prolonged contact. Above these limiting concentrations, within certain limits, the rate of flocculation increases with the concentration of the electrolyte and of the suspension. No essential difference can be observed between the flocculation of bacteria, agglutinin-bacteria, and unorganised suspensions or colloids. The flocculation of bacteria and of agglutinin-bacteria, like that of true suspensions by electrolytes, depends upon the valency of the cation, its rate of migration and decomposition-potential, and the ionisation of the electrolyte. The flocculation of bacteria suspensions cannot be effected by mono- and di-valent cations of high decomposition-potential. The flocculation of unorganised suspensions or colloids of the second order (inorganic colloids) can be prevented by colloids of the first order (albumin, gelatin, &c.), but the latter have no influence on the flocculation of agglutinin-bacteria. The irregular action of salts of trivalent cations in effecting flocculation, is ascribed to the envelopment of the suspension by colloidal aluminium hydroxide, ferric hydroxide, &c., produced by hydrolytic dissociation. By treating bacteria with lead nitrate, alcohol, acids, &c., products are obtained which, with regard to their behaviour towards electrolytes, form intermediate steps between bacteria and agglutinin-bacteria. When a bacterial suspension is subjected to the action of an electric current, the bacteria, like all true suspensions, migrate to the anode. Agglutinin-bacteria are agglutinated by the electric current. With regard to flocculation by salts, agglutinin-bacteria behave like unorganised true suspensions, whilst bacteria behave like unorganised suspensions to which a colloid of the first order has been added.—A. S.

THE SCHÜNK RESEARCH LABORATORY AT MANCHESTER.

The chemical research laboratory, including a library of technical works and periodicals and a fine collection of chemical specimens, relating more particularly to that department of organic chemistry embracing the colouring matters, which the late Dr. Edward Schunck, F.R.S., bequeathed to the Owens College, and which has been transferred from Kersal, Manchester, to the college ground, was formally opened on Friday, July 1st, by Dr. W. H. Perkin, Sen., F.R.S. At the same time the extensions of the College laboratories connecting them with the Schunck laboratory were declared open. The Vice-Chancellor (Dr. Hopkinson) and Prof. H. B. Dixon, F.R.S., spoke of the distinction which Schunck gained by his researches, and of the great value which his gift would be to the Manchester University.

In his address, Dr. Perkin briefly reviewed Dr. Schunck's work, especially in connection with vegetable colouring matters. He remarked that, great as were the difficulties with which Dr. Schunck had to contend in his pioneer work on the constituents of certain plants, the problems which organic chemistry has still to solve, and especially those which deal with physiological chemistry, will be found to offer still greater difficulty. The future progress of physiological chemistry may be said to depend largely on the acquirement of an accurate knowledge of the nature of starch, albumin, and their decomposition products. When investigating problems dealing with the constitution of natural products, it should always be borne in mind that Nature not only builds up its complicated substances from the simplest materials, but that all its operations are carried out at ordinary temperatures and without the use of powerful reagents.

A medallion portrait of the late Dr. Schunck, which Mrs. Schunck has presented to the University, was unveiled by her son, Mr. Charles Schunck, and was formally accepted by Mr. F. J. Broadfield on behalf of the University Court.

New Books.

RADIUM, AND OTHER RADIO-ACTIVE ELEMENTS. A popular account treated experimentally. By LEONARD A. LEVY and HERBERT G. WILLIS. Percival Marshall and Co., 26-29, Poppin's Court, Fleet Street, London, E.C. 1904. Price 2s. 6d.

8vo volume, containing introduction, 97 pages of subject-matter, an appendix of eight pages, and a total of 26 illustrations. The leading subjects treated of are as follows:—I. Discovery of Radium; its Extraction. II. The Radium Emanation. III. and IV. Physical Effects (Electrical and Magnetic). V. Chemical Effects. VI. Actions on Animal Life and Living Tissues. VII. Other Radio-active Elements. APPENDIX. Experimental Apparatus.

SUBJECT LIST OF WORKS ON ELECTRICITY, MAGNETISM, AND ELECTRO-TECHNICS IN THE LIBRARY OF THE PATENT OFFICE. [Pat. Office Library Series, No. 14; Bibliogr. Series, No. 11.] Darling and Son, Ltd., His Majesty's Stationery Office, 84-40, Bacon Street, London, E. Patent Office, 25, Southampton Buildings, Chancery Lane, London, W.C. 1904. Price 6d.

DIE FARBEN-PHOTOGRAPHIE [Photographische Bibliothek, Bd. 19]: EINE GEMEINVERSTÄNDLICHE DARSTELLUNG DER VERSCHIEDENEN VERFAHREN, NEBST ANLEITUNG ZU IHRER AUSFÜHRUNG. Von Dr. E. KÖNIG. Gustav Schmidt's Verlag, Berlin. 1904. Price M. 2.50.

SMALL 8vo volume with coloured frontispiece, preface, introduction, and 87 pages of subject-matter, containing two illustrations. The subjects treated of are the following:—DIRECT METHODS OF COLOUR PHOTOGRAPHY.—1. Becquerel's Process. 2. Lippmann's Process. 3. The Bleaching-out Process. 4. Joly's Method. INDIRECT METHODS OF COLOUR PHOTOGRAPHY.—SECTION I.—The Three-Colour Printing, or Subtractive Method of Tricolour Photography. 1. Photographic Apparatus (Camera). 2. Light Filter. 3. Plates and Sensitisers. 4. Exposure and Development. 6. Finishing of Copies. Appendix. Two-Colour Photography. SECTION II.—The Additive Method of Tricolour Photography by Optical Synthesis. 1. Theoretical. 2. Guide in the Preparation of Partial Pictures. 3. Guide to Preparation of the Chromoscope.

DIE HERSTELLUNG VON DIAPOSITIVEN [Photographische Bibliothek, Bd. 20], ZU PROJEKTIONSZWECKEN (LATEEN-BILDERN), FENSTERTRANSPARENTEN UND STEREOSKOPEN. Von P. HANNEKE. Gustav Schmidt's Verlag, Berlin. 1904. Price M. 2.50.

SMALL 8vo volume with preface, introduction, and 126 pages of subject-matter, containing 25 illustrations, and followed by an alphabetical index. The following are the subjects mainly treated of:—I. The Preparation of Diapositives on Chlorobrominated Silver Plates. II. Preparation of Enlarged or Reduced Diapositives. III. Diapositive on Silver bromide-gelatin Plates. IV. Diapositive on Collodion Plates. V. Diapositive on Albumin Plates. VI. Diapositive on Chloride of Silver Plates for Copying out. VII. Diapositive by the Pigment Process. VIII. Stereoscopic Diapositive. IX. Coloured Diapositive. X. Appendix.

Trade Report.

I.—GENERAL.

CANADA ; TARIFF CHANGES IN —.

Bd. of Trade J., June 23, 1904.

A memorandum (No. 1,284 B), issued by the Canadian Commissioner of Customs, gives in detail the tariff changes as set forth in the resolutions introduced by the Minister of Finance in the Canadian House of Commons on 7th June.

The resolutions, which are now in force (but which are still under discussion in the Canadian House of Commons), contain the following passages:—

1. Resolved, That it is expedient to amend "The Customs Tariff, 1897," to the following effect:—

Notwithstanding anything contained in Schedule D (which refers to the British preferential tariff), the maximum duty on the under-mentioned articles when imported under the British Preferential Tariff shall be as follows:—

	Rate of Duty.
Table ware of china, porcelain or other clay.....	15 % <i>ad val.</i>
Common and colourless window glass.....	7½ % "

Item 203 of Schedule A. shall be repealed and the following substituted therefor:—

203. Plate glass not bevelled, in sheets or panes not exceeding 7 sq. ft. each, n.o.p.	10 % <i>ad val.</i>
203a. Plate glass not bevelled, in sheets or panes exceeding 7 sq. ft. each, and not exceeding 25 sq. ft. each, n.o.p.	25 % "

Items 22, 151, 170, 171, 172, 173, 175, and 178 of Schedule A. shall be repealed and the following substituted:—

22. Paraffin wax candles	25 % <i>ad val.</i>
151. Paraffin wax.....	25 % "
170. Illuminating oils, composed wholly or in part of the products of petroleum, coal, shale, or lignite, costing more than 30 cents. per gall.	30 % "
171. Lubricating oils, composed wholly or in part of petroleum, costing less than 25 cents. per gall.	2½ cents per gall.
172. Crude petroleum, gas oils (other than benzine and gasoline), above 40° Beaumé gravity, at 60° temperature.....	1½ cents per gall.
173. Oils, coal, and kerosine distilled, purified or refined, naphtha and petroleum, and products of petroleum, n.e.s.	2½ cents per gall.
177. Lubricating oils, n.e.s., and axle grease.....	20 % <i>ad val.</i>
178. Vaseline, and all similar preparations of petroleum for toilet, medicinal, or other purposes	25 % "
Molasses, the produce of any British country entitled to the benefits of the British Preferential Tariff, in the original package in which it was placed at the point of production, and not afterwards subjected to any process of treating or mixing; the package also to be free: Provided, however, that this shall not apply to molasses to be used for the purpose of distillation.....	Free.

2. Resolved, that the following articles now dutiable shall be transferred to the free list:—

Whale oil soap	Free.
Plain, basic photographic paper, baryta coated, for albumenizing or sensitizing	"
Hydrofluosilicic acid	"
Glass cut to size for the manufacture of dry plates for photographic purposes, when imported by the manufacturers of such dry plates for use exclusively in the manufacture thereof in their own factories.....	"
Ferment cultures to be used in butter-making..	"
Quassia juice	"
Crude petroleum, fuel and gas oils, 43° Beaumé gravity, or less, at 60° temperature, 0° 8253 sp. gr.	"

II.—FUEL, GAS, AND LIGHT.

CALCIUM CARBIDE INDUSTRY; PROSPECTS OF —
[IN GERMANY].

P. Wangemann. *Chem. Ind.*, 1904, 27, 318—322.

The consumption of carbide in Germany during 1904 will be, it is estimated, about 30,700 tons, whilst the production will be 13,300 tons, leaving 7,400 tons or about 35·7 per cent. of the total to be imported. In discussing the prospects of the carbide industry, attention is drawn to the new fields opened out for calcium carbide by the introduction of dissolved acetylene (see this J., 1901, 1196; 1903, 288), and of calcium cyanamide prepared from calcium carbide and atmospheric nitrogen (this J., 1903, 794, 809).

—A. S.

III.—TAR PRODUCTS, PETROLEUM, Etc.

PARAFFIN LIQUID AND "PARAFFINUM MOLLE":
U.S. CUSTOMS DECISION.

April 26, 1904.

It was held, providing it could be shown that, in "paraffinum molle," ceresin was the component material of chief value, the merchandise was free of duty. The Board of General Appraisers, after thoroughly considering the question of value, decided that the paraffin liquid was composed entirely of petroleum, and, being produced from Russian petroleum, was subject to a countervailing duty equal to that imposed by Russia on imports of the same character from the United States; and, in the case of "paraffinum molle," since the mineral wax or ceresin was present only to the extent of one-fifth, the remaining four-fifths of paraffin liquid were sufficient to render the merchandise subject to the same countervailing duty. (Compare this J., 1903, 930.)—R. W. M.

MINERAL WAX: U.S. CUSTOMS DECISION.

May 17, 1904.

A waxy substance, called ozokerite, containing resins and pitch, was held to be dutiable at 20 per cent. *ad valorem* as a "manufactured article unenumerated."—R. W. M.

IV.—COLOURING MATTERS AND DYE STUFFS.

SULPHIDE DYE STUFFS: U.S. CUSTOMS DECISION.

April 21, 1904.

Sulphaniline Black, Sulphaniline Brown and Sulpho Black T G were decided to be dutiable at 30 per cent. *ad valorem* as "coal tar colors or dyes," under paragraph 15 of the present tariff. The claims of the importers for assessment of duty at 20 per cent. *ad valorem* under the same paragraph as "coal tar preparations," or at 25 per cent. *ad valorem* as "chemical compounds," under paragraph 3, were unsupported by evidence and overruled.—R. W. M.

TETRACHLOROPHTHALIC ACID: U.S. CUSTOMS DECISION.

April 22, 1904.

It was decided that tetrachlorophthalic acid was dutiable at 25 per cent. *ad valorem* as an "acid not otherwise provided for," under paragraph 1 of the present tariff. The claim for assessment of duty at 20 per cent. *ad valorem*, as a "preparation of coal tar" was overruled.—R. W. M.

LOGWOOD BLACK: U.S. CUSTOMS DECISION.

April 22, 1904.

Logwood Black was decided to be dutiable at ½ cent per lb. as "logwood extract," under paragraph 22 of the tariff. The assessment of duty at 30 per cent. *ad valorem* as a "colour" was overruled.—R. W. M.

V.—PREPARING, BLEACHING, Etc., TEXTILES, YARNS, AND FIBRES.

BLEACHER'S BLUE: U.S. CUSTOMS DECISION.

Duty was assessed on bleacher's blue at 30 per cent. *ad valorem* as a "coal tar color," under paragraph 15 of the present tariff. On appeal from a decision of the Board of General Appraisers, affirming the above assessment, the United States Circuit Court reversed the decision, and held that bleacher's blue was dutiable at 20 per cent. *ad valorem*, under the same paragraph as a "preparation of coal tar, not a color or dye."—R. W. M.

VII.—ACIDS, ALKALIS, Etc.

BARYTES: U.S. CUSTOMS DECISION.

April 25, 1904.

The Treasury Department holds that barytes separated by crushing and jigging from the accompanying worthless

rock is dutiable at 75 cents per ton, as "barytes unmanufactured," and not at 5 dols. 25 cents per ton, as "manufactured barytes."—R. W. M.

MANGANESE BORATE: U.S. CUSTOMS DECISION.

May 9, 1904.

The United States Circuit Court of Appeals at Philadelphia decided that manganese borate used chiefly as a drier for varnish is dutiable at 25 per cent. *ad valorem* as a "chemical compound or salt," under paragraph 3 of the present tariff, and not at 3 or 4 cents per lb., under paragraph 11, according as the contents of anhydrous boric acid is above or below 36 per cent. The Court held that the article is not a borate material, but a product of the borate materials enumerated in paragraph 11.—R. W. M.

BORAX GLASS POWDER: U.S. CUSTOMS DECISION.

April 29, 1904.

Powdered borax glass, which on analysis was shown to contain 66.86 per cent. of anhydrous boric acid, was held to be dutiable at 5 cents per lb. as "borax," under paragraph 11 of the present tariff.—R. W. M.

COPPER ACETATE: U.S. CUSTOMS DECISION.

May 30, 1904.

Copper acetate was held to be dutiable at 25 per cent. *ad valorem* as a "chemical salt" under paragraph 3 of the present tariff. The claim that it was free as "verdigris or subacetate of copper" under paragraph 694 was overruled.—R. W. M.

X.—METALLURGY.

OUTPUT OF CERTAIN MINERALS AND METALS IN THE WORLD IN 1902.

Bd. of Trade J., June 16, 1904.

The colonial and foreign section of the Mines and Quarries Report for the year 1902 contains a table showing the output of certain minerals and metals (contained in or obtained from ore raised) in the British Empire and in foreign countries during the year 1902. The following is a brief summary of the table in question:—

	United Kingdom.	British Colonies and Possessions.	Foreign Countries.	Total.
Coal..... Met. tons	230,739,359	25,264,062	547,153,634	803,157,045
Copper... Kilca.	490	51,718	519,844	571,952
Fine gold... silver	116	232,391	215,137	447,644
Iron..... Met. tons	4,470,420	460,060	4,288,831	4,753,451
Lead..... "	17,988	714,227	37,484,831	42,699,478
Petroleum .. "	25	25,124	759,835	802,947
Salt..... "	1,924,373	298,701	22,568,134	22,868,900
Tin..... "	4,462	1,275,948	10,079,811	13,279,082
Zinc..... "	9,275	51,496	37,493	93,441
		576	493,397	503,241

MINES AND QUARRIES: GENERAL REPORT AND STATISTICS FOR 1903. PART I. DISTRICT STATISTICS. [Cd. 2,115.] Price 6½d.

This return, which forms the first part of the General Report on Mines and Quarries for 1903, contains statistics of the number of persons employed, the output of minerals, and of accidents at mines and quarries in the United Kingdom arranged according to the inspection districts. The total output of the undermentioned minerals in the United Kingdom in 1903 as compared with 1902 was as follows:—

	1902.	1903.
	Tons.	Tons.
Coal.....	237,095,048	230,334,469
Clays and shale.....	15,304,136	16,198,021
Iron ore.....	13,426,817	13,715,645
Limestones (other than chalk).....	12,172,851	12,222,971
Igneous rocks.....	5,406,964	5,425,538
Sandstone.....	5,483,130	5,409,502
Chalk.....	4,395,673	4,468,974

MINES OF BRITISH COLUMBIA.

U.S. Cons. Reps., No. 1977, June 13, 1904.

From the annual report of the Minister of Mines of British Columbia for 1903, just issued, it appears that the total production of the mines of the Province show a very slight increase over the year previous, being of the value of 17,495,954 dols., compared with 17,486,550 dols. in 1902. Excepting copper and coke, which show an increase, there is a falling off in all products, as shown by the following table:—

Description.	1902.		1903.	
	Quantity.	Value.	Quantity.	Value.
Gold:—		Dols.		Dols.
Placer..... Ozs.	53,657	1,073,140	53,021	1,060,420
Lode..... "	236,491	4,888,299	232,831	4,812,618
Silver.....	3,917,917	1,941,338	2,996,204	1,521,472
Copper..... Lb.	29,636,067	3,446,673	34,359,921	4,647,535
Lead.....	22,536,381	824,832	18,069,283	689,744
Coal..... Tons	1,397,394	4,192,162	1,168,194	3,504,582
Coke.....	128,015	640,075	165,548	827,715
Other minerals.....	..	480,051	..	531,870
Total.....	..	17,486,550	..	17,495,954

ALLOYS: U.S. CUSTOMS DECISION.

May 30, 1904.

An alloy consisting of iron, manganese, and aluminium, and used for hardening bronze, was held to be dutiable at 8 cents per lb. under paragraph 179 as an "alloy in which aluminium is the component material of chief value." Another alloy, consisting of copper and tin, used to manufacture anti-friction bearings, was decided to be dutiable at 20 per cent. *ad valorem* as a "metal unwrought," under paragraph 183.—R. W. M.

XII.—FATS, FATTY OILS, Etc.

SPERMATINE: U.S. CUSTOMS DECISION.

May 5, 1904.

A waxy substance, which was stated to be obtained from brown coal in central Germany by extraction with benzine (petroleum spirit) and subsequent distillation and refining was held to be free of duty as "mineral wax," under paragraph 695 of the present tariff. The assessment of duty at 20 per cent. *ad valorem* as a "manufactured article unenumerated," was overruled.—R. W. M.

ADEPS LANE CUM AQUA: U.S. CUSTOMS DECISION.

This substance was decided to be dutiable at 25 per cent. *ad valorem* as a "medicinal preparation, not alcoholic." The claim for assessment of duty at ½ cent per lb. as "wool grease," was overruled, on the ground that it was not the wool grease of commerce, and on the authority of a decision of the United States Circuit Court of Appeals.—R. W. M.

XIII. C.—INDIA-RUBBER, Etc.

RUBBER; EXPORT TAX ON — IN BRAZIL.

U.S. Cons. Rep., No. 1977, June 13, 1904.

Until lately the State of Amazonas has imposed an export tax on all rubber coming into its jurisdiction from up the Amazon river. This export tax has now been reduced from 20 per cent. of the declared value to 15 per cent., and the owner or purchaser of rubber grown outside of the state of Amazonas is at liberty to ship his rubber from Manaus or Para, as he pleases.

The amount of rubber affected by the new regulation is estimated at not less than 7,000 tons. Of this quantity, it is believed that 5,000 tons will come to Para.

XVI.—SUGAR, STARCH, Etc.

CHARCOAL: U.S. CUSTOMS DECISION.

May 4, 1904.

Charcoal, used for decolorising purposes, was held to be dutiable at 20 per cent. *ad valorem*, as a "manufactured

article unenumerated." The assessment of duty at 35 per cent. *ad valorem*, as an "article composed of carbon," was overruled.—R. W. M.

XVII.—BREWING, WINES, SPIRITS, Etc.

DUTY-FREE SPIRIT QUESTION IN RUSSIA.

Z. *Spiritusind.*, 1904, 27, 249.

The reported Russian law to the effect that the use of duty-free technical spirit would be given a three years' trial, is confirmed, the matter being now in the hands of the Minister of Finance. The Minister called together in February, at St. Petersburg, a Congress of Distillers who were to make themselves individually conversant with the progress in the use of technical spirit, and express their opinions as to the best method of organisation for the sale of the spirit. The Minister proposed the formation of co-operative associations of distillers for the sale of technical spirit and for promoting the use of such spirit. These associations would be responsible for the observance of the strict regulations drawn up by the Minister for the sale and control of the spirit. The Congress declared themselves generally in agreement with the proposals of the Minister. They considered it desirable that each association of distillers should be limited to a definite radius; that the associations should combine to form unions and that periodic "union congresses" be held; and finally that a permanent board with full powers should be formed in St. Petersburg. The responsibility for the observance of the regulations as to the sale of the spirit could only be undertaken by the associations, if they were granted exclusive rights with regard to the sale of technical spirit. The Congress elected a committee for the defence of the interests of the spirit distillers, and this committee was charged with the drawing up of rules for the new associations to be formed for the sale of technical spirit. They also resolved to petition the Government:—(1) to remit the customs tax on engines, burners, lamps, &c., designed for the use of denatured spirit, provided similar goods are not manufactured in Russia; (2) to reduce the tariff for the transport of denatured spirit; and (3) to discontinue the inspection and control of manufacture in the case of agricultural distilleries and to introduce a scheme of obligatory mutual insurance of such distilleries. The Minister is continuing his efforts to discover a suitable denaturing process. Apart from the prize of 50,000 roubles (see this J., 1903, 1109), the professors of the Kiev Polytechnic are experimenting with ketones. The Minister of Agriculture is also interesting himself in the use of technical spirit, and in conjunction with the Imperial Russian Technical Society, has resolved to organise in the course of the year an exhibition in St. Petersburg on the lines of the one held in Vienna.

—A. S.

ALCOHOL TAX IN U.S.A.

On May 23, 1904, the United States Circuit Court decided that the local taxes on alcohol in France, known as the *octroi*, or *droit de ville*, which are not collected on merchandise exported, are not part of the dutiable value of merchandise imported into the United States.—R. W. M.

XX.—FINE CHEMICALS, Etc.

SACCHARIN IN GLYCERIN: U.S. CUSTOMS DECISION.

May 7, 1904.

A preparation consisting of 20 per cent. of saccharin and 80 per cent. of refined glycerin was decided to be dutiable at 1 dol. 50 c. per lb. and 10 per cent. *ad valorem* as "saccharin" under paragraph 211 of the present tariff, on the ground that the saccharin was the component material of chief value.—R. W. M.

CHRYSAROBIN: U.S. CUSTOMS DECISION.

June 1, 1904.

It was decided that chrysarobin, extracted from Goa powder, is dutiable at 25 per cent. *ad valorem*, as a "medicinal preparation."—R. W. M.

OPIMUM POWDERED: U.S. CUSTOMS DECISION.

May 6, 1904.

It was decided that powdered opium was dutiable as "opium crude," at 1 dol. per lb. under paragraph 43 of the present tariff. The claims of the importer that it was dutiable at $\frac{1}{4}$ cent per lb. and 10 per cent. *ad valorem*, under paragraph 20 as a "drug, advanced in value or condition," or at 25 per cent. *ad valorem* as a "medicinal preparation," under paragraph 68, were overruled.

—R. W. M.

HEROINE AND HEROINE HYDROCHLORIDE: U.S. CUSTOMS DECISION.

April 22, 1904.

Heroine and its hydrochloride were decided not to be true salts or alkaloids of opium, but new chemical bodies derived from morphine. For this reason the Board of General Appraisers reversed the assessment of duty at 1 dol. per ounce, as "salts or alkaloids of opium," under paragraph 43, and sustained the claim of the importers that both were dutiable at 25 per cent. *ad valorem*, as "medicinal preparations in the preparation of which alcohol is used."

—R. W. M.

SYNTHETIC OILS: U.S. CUSTOMS DECISION.

June 2, 1904.

Synthetic oils of jasmine, "amber," bergamot, and neroli were held to be free of duty under their respective names, as provided for in paragraph 626 of the present tariff.

—R. W. M.

ORANGE FLOWER WATER: U.S. CUSTOMS DECISION.

April 20, 1904.

In accordance with a decision of the United States Circuit Court, the Board of General Appraisers held that orange flower water is dutiable at 25 per cent. *ad valorem* as a "medicinal preparation, not alcoholic," under paragraph 68 of the present tariff.—R. W. M.

Patent List.

N.B.—In these lists, [A.] means "Application for Patent," and [C.S.] "Complete Specification Accepted."

Where a Complete Specification accompanies an Application, an asterisk is affixed. The dates given are (i) in the case of Applications for Patents, the dates of application, and (ii) in the case of Complete Specifications Accepted, those of the Official Journals in which acceptances of the Complete Specifications are advertised.

Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, AND MACHINERY.

- [A.] 13,481. Sulman and Kirkpatrick-Picard. Removal of precipitates from liquids. June 14.
- " 13,638. Dewar. Method of absorbing gases, and the application thereof to the production of high vacua and the separation of gases. June 16.
- " 13,765. Johnson. Apparatus for separating coal, slack, ores, minerals, or substances of different specific gravity. June 17.
- " 13,892. Gayley. Appliances for extracting moisture from air and feeding such air to blast furnaces or converters.* June 20.
- " 14,042. Parsons. Production of high vacua. June 21.
- " 14,067. Kaehl. Centrifugal separating apparatus. [Ger. Appl., July 31, 1903.]* June 21.
- " 14,337. Bigallet, Olivo, and Maurin. Tuyères for melting furnaces or cupolas, and the method of charging such furnaces. June 25.

- [A.] 14,631. Bonnet. Apparatus for mixing, emulsifying, and homogenising liquids.* [Fr. Appl., July 1, 1903.] June 29.
- [C.S.] 17,348 (1903). Holt. Means of softening and filtering water for steam boilers, economisers, bleaching, dyeing, &c., and apparatus therefor. July 6.
- " 18,869 (1903). Gerhardt. Distillation apparatus. June 29.
- " 26,213 (1903). Roney. Furnaces. June 22.
- " 26,471 (1903). Strehlenert. Centrifugal extraction apparatus. July 6.

II.—FUEL, GAS, AND LIGHT.

- [A.] 13,316. Everitt. Method of extracting tar and other impurities from crude illuminating, heating, or power gases. June 13.
- " 13,367. Payens and Neuman. Generators for the manufacture of generator gas, water gas, &c. June 13.
- " 13,377. Roux, Gonin, and Thompson. Purification of coal gas with the resulting bye products. June 13.
- " 13,517. Dunlop and Kynoch, Ltd. Gas-producing plant. June 15.
- " 13,563. Linden. Gas generators. June 15.
- " 13,576. Hartridge. Manufacture of artificial fuel. June 15.
- " 13,647. Woods. Manufacture of incandescent mantles for gas lamps. June 16.
- " 13,822. Whittaker, and C. Whittaker and Co. (1900), Ltd. Manufacture of peat fuel, and apparatus therefor. June 18.
- " 13,877. Hatton. Gas producers. June 20.
- " 14,157. Armstrong. Manufacture of coke, and furnaces, ovens, and apparatus therefor. June 22.
- " 14,196. British Thomson - Houston Co. (General Electric Co.). Electrodes for arc lighting. June 23.
- " 14,219. Höpfner. Manufacture of artificial fuel, and apparatus therefor. June 23.
- " 14,288. Valeriola, Sepulchre, and Moeller. Manufacture of incandescent mantles. June 25.
- " 14,333. Elworthy and Williamson. Manufacture of gas for illuminating, heating, and power purposes. June 25.
- " 14,355. Gersabeck. Process for generating air-gas.* June 25.
- " 14,383. Poetter. Gas producers.* June 25.
- " 14,389. Gerdes. Manufacture of fuel blocks or briquettes. June 25.
- " 14,445. Boulton (Lomax). Method of purifying illuminating gas.* June 27.
- " 14,500. Carter and Fowler. Method of chemically treating arc-lamp carbons, whereby all wastage is stopped on same while lamp is burning, &c., &c. June 28.
- " 14,563. Warren and Skinner. Apparatus for generating combustible gas from liquid hydrocarbons. June 28.
- " 14,718. Carpenter. Apparatus for use in the gasification of coal or other materials in the production of illuminating and heating gas.* June 30.
- [C.S.] 13,763 (1903). Crossley and Rigby. Regulation of gas producers. June 22.
- " 13,764 (1903). Crossley and Rigby. Gas producers. June 22.
- " 14,014 (1903). Cory. Artificial fuel. June 29.
- " 14,663 (1903). International Oxy-generator Syndicate, Ltd., and Rosenberg. Oxy-hydrogen combustion apparatus. July 6.

- [C.S.] 17,103 (1903). Timmis. Means for getting more perfect combustion of fuel in the fire-chambers of boilers, and also for the prevention of smoke and sparks. July 6.
- " 17,215 (1903). Westinghouse (Gow). Method of and apparatus for the manufacture of gas. July 6.
- " 22,451 (1903). Evered and Co. (Weiblen). Incandescent mantles. June 29.
- " 33,111 (1904). Kurzwernhart. Siemens regenerative furnaces. June 29.
- " 33,255 (1904). Buhlmann. Process of manufacturing incandescent mantles. June 22.
- " 12,331 (1904). McLean and Paterson. Treatment of peat. July 6.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM, AND MINERAL WAXES.

- [A.] 14,417. Paterson. Process for recovering phenol from carbolic solutions. June 27.
- [C.S.] 13,473 (1903). Thompson (Ges. z. Verwertung der Boleg'schen Wasserdämpfe). Production of lubricants. June 22.
- " 17,973 (1903). Aminaff. Dry distillation of organic substances. June 29.
- " 21,022 (1904). Coulson. Method of solidifying tar. June 29.

IV.—COLOURING MATTERS AND DYESTUFFS.

- [A.] 13,941. Lake (Oehler). Manufacture of mordant dyes.* June 20.
- " 13,956. Johnson (Badische Anilin und Soda Fabrik). Manufacture of hydroxyethylaniline and derivatives thereof. June 20.
- " 14,289. Vidal and Junius. Reducing nitrosed or nitrated aromatic compounds whereby iron oxides are produced which may be used as oil colours, &c. June 25.
- " 14,506. Heys (Sansone). Production of indigo derivatives and sulphur colours, and their use in printing and dyeing. June 28.
- " 14,566. Lorrain (Bell). Dye-compound.* June 28.
- " 14,634. Newton (F. Bayer and Co.). Manufacture and production of new colour-lakes. June 29.
- [C.S.] 14,768 (1903). Ellis (Chem. Fabr. vorm. Sandoz). Manufacture of azo dyestuffs. June 22.
- " 17,792 (1903). Ransford (Cassella and Co.). Manufacture of a new acetdiamidophenolsulphonic acid and of colouring matters therefrom. June 22.
- " 18,283 (1903). Imray (Meister, Lucius und Brüning). Manufacture of a tetrazo-phenolsulphonic acid. July 6.
- " 10,678 (1904). Lake (Oehler). Halogenised nitro-compounds. July 6.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

- [A.] 13,302. O'Brien (L'Huillier). Dyeing, and apparatus therefor.* June 13.
- " 13,382. Long and Kay. Cleaning and permanently restoring colour in fabrics. June 14.
- " 13,484. Dolder. Process for the dyeing of cotton and the like in the form of cops, spools, &c., with alizarin red. June 14.
- " 13,485. Thompson (Wickels Metallpapierwerke). Method of producing a silky appearance on cotton and other fabrics. June 14.

- [A.] 13,778. De Keukelaere. Process for treating flax, jute, and similar fibres for the purpose of bleaching. June 17.
- " 13,867. Muntadas y Rovira. Process and apparatus for the bleaching of fabric and yarn. [Ger. Appl., June 18, 1903.]* June 18.
- " 13,879. Bailey and Cason. Manufacture of artificial silk threads. June 20.
- " 13,995. Kemp (Morley). Dyeing machine for dyeing raw cotton, loose wool or silk, rags, mungo, yarns of all kinds, and slubbing. June 20.
- " 14,182. Greenwood. Mercerising and lustreing textile fibres and fabrics. June 23.
- " 14,202. Roberts and Mitchell. Extracting or carbonising in all classes of pieces of cloth or yarn made from animal fibre. June 23.
- " 14,869. McWhirter. *See under IX.*
- [C.S.] 13,558 (1903). Reid. Method and apparatus for treating spun fibres with liquids for dyeing, bleaching, and other purposes. June 23.
- " 14,191 (1903). Berger. Apparatus for the treatment of wool elvers. June 29.
- " 14,472 (1903). Burdick and Pervilhac. Process for colouring, decorating, or printing textiles, paper, &c. June 29.
- " 17,616 (1903). Hoyle and Barker. Production of bleached yarn, and appliances therefor. June 22.
- " 9811 (1904). Stöhr. Apparatus for dyeing hanks of yarn. June 29.

VII.—ACIDS, ALKALIS, AND SALTS.

- [A.] 13,565. Castiglioni and Calastretti. Process for reducing sulphates of the alkaline earths and of the alkalis to sulphides, and for reducing metallic oxides to metals. [Italian Appl., June 20, 1903.]* June 15.
- " 13,827. Grossmann. Method of obtaining ferrocyanide and ammonia compounds from crude coal-gas. June 18.
- " 13,875. Levi. Production of alumina and alkali from alkaline silicates of alumina, such as leucite. June 18.
- " 13,955. Johnson (Badische Anilin und Soda Fabrik). Manufacture of reducing agents. June 20.
- " 13,981. Behrens and Behrens. Processes for manufacturing carbonic acid.* June 20.
- " 14,431. Pictet. Apparatus for the separation of oxygen and nitrogen from air. [French Appl., June 27, 1903.]* June 27.
- " 14,464. Lake (Dr. Alb. R. W. Brand and Co.). Recovery of carbonic acid from waste gases. June 27.
- " 14,848. Artigue. Apparatus for the commercial manufacture of oxygen. [French Appl., July 6, 1903.]* July 1.
- " 14,859. Hargreaves. *See under XI.*
- [C.S.] 14,213 (1903). Price. Apparatus for the separation of oxygen and nitrogen from air. July 6.
- " 18,594 (1903). Newton (F. Bayer and Co.). Manufacture and production of nitrous anhydride and nitrites. July 6.
- " 20,069 (1903). Davis. Manufacture of alkaline prussiates. June 29.
- " 26,007 (1903). Brothers. Manufacture of crystalline gypsum for filling purposes. June 29.
- " 28,400 (1903). Hunt. *See under XI.*
- " 28,682 (1903). Soc. pour l'Exploitation des Procédés Georges Claude. Process and apparatus for separating gaseous mixtures, applicable for the separation of oxygen and nitrogen from liquid air. June 22.
- " 10,538 (1904). Alsop. Method of generating a gaseous medium from air. June 22.

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- [C.S.] 18,255 (1903). Carolan (General Electric Co.). Methods of sealing metal into glass or other vitreous material. June 29.
- " 18,290 (1903). Dansette. Ceramic tiles, plates, &c. June 29.
- " 28,790 (1903). Fourcault. Apparatus for manufacturing glass sheets or plates. June 29.
- " 10,649 (1904). Dolley and Belknap. Ornamental glass. June 22.

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- [A.] 13,644. Baudry. Process of making Portland cement from slag. June 16.
- " 14,138. Boulton (Buffard). Luting or cement. June 22.
- " 14,183. Conti-Vecchi. Process of and means for impregnating wood with antiseptic and like substances or liquids.* June 23.
- " 14,297. Rynd. Preparation of pipeclay. June 25.
- " 14,869. McWhirter. Apparatus for heating, steaming, and chemically treating wood and fabrics of different kinds, and for drying such articles. July 2.
- [C.S.] 14,366 (1903). Wirtz. Process for obtaining a substitute for emery and like substances from slag. June 29.
- " 16,412 (1903). Winstanley. Process of and machines for preparing lime and Portland cement. June 22.
- " 18,064 (1903). Williams. Manufacture of cement for use in repairing retorts, &c. June 29.
- " 7843 (1904). Neusch (Westdeutsches Thomas-phosphat Werke). Asphalt composition for floors and the like. June 22.
- " 7736 (1904). Spatz. Manufacture of fireproof stone or stoneware and mortar. June 29.
- " 10,040 (1904). Devillers. Process for the manufacture of slabs or sheets imitating marble. July 6.
- " 11,218 (1904). Wulf. Manufacture of a floor covering. June 22.

X.—METALLURGY.

- [A.] 13,328. Pelletier and Semprun. Solder for aluminium or its alloys.* June 18.
- " 13,462. Fris. Treatment of earths containing gold or other precious metals or gems. June 14.
- " 13,565. Castiglioni and Calastretti. *See under VII.*
- " 13,578. Elmore. Process for separating certain constituents of subdivided ores, &c., and apparatus therefor. June 15.
- " 13,579. Cowper Coles and Co., Ltd., and Cowper-Coles. Deposition of metals or metallic compounds on metals or metallic articles. June 15.
- " 13,648. Woods. Utilisation and separation of refuse metals. June 16.
- " 13,730. Lewis. Metallic alloys. June 17.
- " 13,744. Flewin. Gold extractor and concentrator. June 17.
- " 14,213. Simpkin and Ballantine. Manufacture of briquettes. June 23.
- " 14,214. Simpkin and Ballantine. Means for dephosphorising iron ores and concentrates. June 23.
- " 14,302. Cameron. Process for the production of oxydulated iron. June 25.
- [C.S.] 13,454 (1903). Huntington and Heberlein. Process for treating sulphide ores or compounds preparatory to smelting. June 22.
- " 14,013 (1903). Cory. Treatment of ores. June 29.

- [C.S.] 17,445 (1903). Rouse and Cohn. Method of converting into briquettes or lumps, iron sand, whether natural or prepared by reducing iron ore or iron wastes. June 22.
- " 18,763 (1903). Savelberg, Wannschaff, and Allgem. Elektro-Metallurgische Ges. Extraction of heavy metals by means of chlorine. June 23.
- " 19,366 (1903). Abel (Siemens und Halske Akt. Ges.). Reducing metallic compounds and fusing metals, in particular nickel and iron, in the electric furnace. June 29.
- " 7981 (1904). Mercadier. Manufacture of spongy porous lead and of articles therefrom. June 22.

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- [A.] 13,579. Cowper-Coles. *See under X.*
- " 13,759. Borchers and Hupperts. Production of titanium from its oxygen compounds electrolytically. [German Appl., June 18, 1903.]* June 17.
- " 13,952. Imray (Soc. Anon. d'Études Electrochimiques). Apparatus operating with automatic regulation for submitting gases and vapours to the action of the electric arc. June 20.
- " 14,058. Potthoff. Solutions for the electro-deposition of metal.* June 21.
- " 14,959. Potthoff. Apparatus for electro-galvanising.* June 21.
- " 14,128. Leitner. Preliminary treatment for accumulator plates. June 23.
- " 14,147. Cowper-Coles and The Metals Corporation, Ltd. The electrolytic deposition of metals. June 22.
- " 14,504. Hargreaves. Electrolytic cells. June 28.
- " 14,859. Hargreaves. Manufacture of carbon. July 2.
- [C.S.] 17,885 (1903). Wood-Smith. Apparatus for ozonising air and other gases. June 22.
- " 19,366 (1903). Abel (Siemens und Halske Akt. Ges.). *See under X.*
- " 28,400 (1903). Hunt. Process for the production of hydroxides and oxides of metals by electrolysis. June 22.

XII.—FATTY OILS, FATS, WAXES, AND SOAP.

- [A.] 13,451. Zimmermann and Stöhr. Manufacture of a floating soap.* June 14.
- " 13,529. Smith. Treatment and refining of oils and fatty substances. June 15.
- " 13,983. Stockhausen. Compounds of sulphonated oils and fats, and the method of producing same. June 20.
- " 14,482. Wheelwright and Fiske. Apparatus for cooking garbage and offal, and removing the oil therefrom.* June 27.
- " 14,483. Wheelwright and Fiske. Apparatus for cooking garbage or offal, and removing the oil therefrom.* June 27.
- " 14,709. Wheelwright and Fiske. Apparatus for removing oil or grease from garbage and offal.* June 30.
- " 14,808. Mitchell. Manufacture of soap. July 1.
- [C.S.] 15,457 (1903). Macalpine. Appliance for use in refining oils. June 29.
- " 4867 (1904). Hearson (Frank and Ziegler). Process for the extraction of fat or wax like substances from hydrous materials. June 22.

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- [A.] 13,923. Lekeu and Tonglet. Paint, and the manufacture thereof.* June 20.
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- " 14,203. Castet. Process and apparatus for the extraction of tannin at a low temperature and at a low pressure. June 23.
- [C.S.] 11,094 (1904). Lewis. Manufacturing soluble albumen from milk. June 22.

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- [A.] 13,361. Mathesius. Process of manufacturing an artificial manure. [German Appl., June 18, 1903.]* June 13.
- " 13,664. Hamerschlag. Manufacture of artificial manures or fertilisers. June 16.
- " 13,842. Mensel. Manufacture of fertilisers and cattle foods.* June 18.

XVI.—SUGAR, STARCH, GUM, Etc.

- [A.] 13,833. Stein and Loewenthal. Manufacture of sugar and other food for diabetics. June 18.
- " 14,205. Lichtenstein. Manufacture of caramel or caramel solution. June 23.
- [C.S.] 19,499 (1903). Calico Printers' Assoc., Browning, and Barlow. Production of soluble starch or dextrin. June 29.

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- [A.] 14,028. Schneible. Art of brewing.* June 21.
- " 14,882. Hunt. Maturing and improving the aroma of raw whiskey and other spirits and also certain wines. June 25.
- " 14,472. Moberts. Manufacture of beer. June 27.
- " 14,827. Hunt. Treatment of whiskey and other spirits. July 1.

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- [A.] 13,333. Dreaper. Manufacture of food substances. June 13.
- " 13,689. Foelsing. Preservative for food.* June 16.
- " 13,715. Hutmaker. Milk foods. June 17.
- " 13,833. Stein and Loewenthal. *See under XVI.*
- " 14,010. Lehman. Process for humanising cows' milk and condensing it to a dry state. June 21.
- " 14,588. Beadle and Stevens. Manufacture of food-stuffs. June 29.
- [C.S.] 5102 (1904). von Dalfsen. Production of an article of food from sweet cassava. June 22.
- " 11,094 (1904). Lewis. *See under XIV.*

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- [A.] 13,436. Vial. Water clarification. June 14.
- " 13,588. Henderson. Treatment of sewage. June 15.

- [A.] 14,008. Schweitzer. Apparatus for treating sewage. June 21.
- „ 14,452. Kloeters. Disinfection. June 27.
- „ 14,482. Wheelwright and Fiske. *See under XII.*
- „ 14,483. Wheelwright and Fiske. *See under XII.*
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- „ 14,709. Wheelwright and Fiske. *See under XII.*
- [C.S.] 18,569 (1903). Fidler. Method of and apparatus for removing sludge, &c. from settling tanks. July 6.
- „ 18,570 (1903). Fidler. Settling or precipitating tanks. July 6.
- „ 11,900 (1904). Bordigoni. Bacterial or septic tank treatment of sewage. July 6.

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- [A.] 14,447. Hennesen and Spix. Process of manufacturing figured glazed paper.* June 27.
- [C.S.] 16,604 (1903). Stearn and Topham. Manufacture or treatment of filaments from viscose. June 29.
- „ 16,605 (1903). Stearn and Topham. Apparatus for pumping and controlling the passage of liquids or semi-liquids, and more especially of solutions of cellulose, in the manufacture of filaments. July 6.

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- [A.] 14,014. Boehm (Merck). Manufacture of barbituric acid and intermediate products. June 21.
- [C.S.] 14,189 (1903). Lienan and Naschold. Purification of pinene hydrochloride. July 6.
- „ 14,758 (1903). Bouveault and Blanc. Manufacture of alcohols and alcohol derivatives applicable as perfumes, flavourings, &c., and of primary alcohols generally. June 22.
- „ 18,245 (1903). Newton (F. Bayer and Co.). Manufacture of a pharmaceutical compound. June 22.

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- [C.S.] 18,370 (1903). Bloxam (Neue Photographische Ges.). Reproduction of pictures or the like by aid of catalysis. June 22.

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- [A.] 13,562. Moller. Manufacture of nitro-glycerine. June 15.
- „ 14,480. Ceipek. Explosives. June 27.
- [C.S.] 14,825 (1903). Lake (Alf. Nobel and Co.). Explosives. July 6.
- „ 12,238 (1904). Reine. Means for igniting fuses. July 6.

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Walter C. Han- } II., VIII., cock, B.A. } IX.	W. P. Skertchley ... { XII, { XVIII.
R. S. Hutton XI.	E. Sonstadt, III., VII., X., XV.
R. L. Jenks { XIII. C., { XIV., XIX.	A. B. Steven, B.Sc. IV., V.
F. H. Leeds { II., III., { XIII., XXI.	E. Howard Tripp, } III., VII., { XVI.
	L. J. de Whalley, B.Sc. ... XVI.

Notices.

ANNUAL GENERAL MEETING, NEW YORK, 1904.

The Annual General Meeting will be held in New York City on Thursday, Sept. 8th, and following days. Members who propose to attend the meeting are requested to inform the General Secretary, as soon as possible, by what steamer they will travel. The principal boats will be met on arrival at New York by a representative of the Reception Committee, who will escort the guests to the Hotel Seville, Madison Avenue and 29th Street, which will be the Society's Headquarters in New York. A similar system will be observed at all the other cities visited by the special train. A revised programme appeared in the March 31st issue.

In accordance with the provisions of Rule 18 of the Bye-laws, notice is hereby given that those members whose names are printed in *italics* in the list of Council will retire from their respective offices at the forthcoming Annual Meeting.

Mr. Wm. H. Nichols has been nominated to the office of President under Rule 8; Dr. Edw. Divers, Prof. W. R. Eaton Hodgkinson, Mr. Max Muspratt, and Mr. T. J. Parker have been nominated Vice-Presidents under Rule 8; and Sir Wm. Ramsay has been nominated a Vice-President under Rule 11.

The Hon. Treasurer and Hon. Foreign Secretary have been nominated for re-election to their respective offices.

ST. LOUIS EXHIBITION.

Copies of the Catalogue of the British Chemical Exhibits at the St. Louis Exhibition, with descriptive articles by experts, may be obtained by members on application at the office of the Royal Commission, 47, Victoria Street, Westminster, price 1s. each.

TAX-FREE ALCOHOL.

The following resolution, passed by the Chemical Section of the London Chamber of Commerce and approved by the Council of the Chamber, has been endorsed by the Council of this Society:—"That the Chancellor of the Exchequer be urged to appoint a departmental committee, including recognised commercial and scientific representatives, to examine and report upon the best method of providing untaxed alcohol for manufacturing and other purposes, such as power, heating, and lighting."

COMMUNICATIONS.

Authors of communications read before the Society, or any of its Local Sections, are requested to take notice that under Rule 43 of the Bye-laws the Society has the right of priority of publication for three months of all such papers. Infringement of this Bye-law renders papers liable to be rejected by the Publication Committee, or ordered to be abstracted for the Journal, in which case no reprints can be furnished to the author.

List of Members Elected

22nd JULY 1904.

Brandeis, R., Aüssig, Austria, Chemical Manufacturer.

Carel, Prof. Hubert C., Laboratory of Medical Chemistry, University of Minnesota, Minneapolis, Minn., U.S.A., Chemist (State Board of Health).

Coubrough, Col. John, Banfield, Stirlingshire.

Clarke, A. R., 613-617, Eastern Avenue, Toronto, Canada, Leather Manufacturer.

Danker, Dan. J., 247, Atlantic Avenue, Boston, Mass., U.S.A., Dyestuff and Chemical Manufacturer.

Ermen, Walter F. A., 14, Park Road, Pendleton, Lancashire, Analytical Chemist.

Gyr, Dr. K. H., c/o Messrs. Joseph Fison and Co., Ltd., Ipswich, Analytical Chemist.

Hamilton, E. H., Anaconda Copper Mining Co., Anaconda, Montana, U.S.A., Assistant Superintendent.

Holloway, E. G., 447, Belle Plain Avenue, Chicago, Ill., U.S.A., Chemist.

Hooker, A. H., c/o Heath and Milligan Manufacturing Co., 170, Randolph Street, Chicago, Ill., U.S.A., Manufacturing Chemist.

Kaye, Thomas, Westerfield, Perth, Scotland, Analytical Chemist.

Litter, Hans, Farbenchemisches Laboratorium der Kgl. Technischen Hochschule, Dresden, Germany, Chemist.

Liverseege, J. F., Council House, Birmingham, Public Analyst.

McKenna, A. G., 506, Hawkins Avenue, Braddock, Pa., U.S.A., Metallurgical Chemist.

Marshall, Adolf J., Little Falls, N.Y., U.S.A., Chemist.

Mighill, Thos. A., 127, Purchase Street, Boston, Mass., U.S.A., Chemist.

Rostosky, Dr. Leopold, Tiergartenstrasse 28, Dresden Alt, Saxony, Chemist.

Shedden, Frank, 5, Belvidere Road, Walsall, Science Master.

Southerden, Frank, 75, Barry Road, Dulwich, S.E., Teacher of Chemistry.

Wackenreuter, A.G., 134-136, Kinzie Street, Chicago, Ill., U.S.A., Colour Manufacturer.

Wedekind, Rud., Uerdingen a/Rhein, Germany, Manufacturer of Alizarin and Bichromates.

Whittier, Chas. T., 322, Warren Street, Jersey City, N.J., U.S.A., Manager.

Wünsche, Fritz, Reichenbachstrasse 25 p., Dresden-Altt., Germany, Chemist.

Zimmele, H. B., 621, Main Street, Niagara Falls, N.Y., U.S.A., Technical Chemist.

Changes of Address.

When notifying new addresses, members are requested to write them distinctly, and state whether they are temporary or permanent. Multiplication of addresses is also to be avoided as tending to create confusion. When sending subscriptions, the use of the form attached to the application helps in the verification of addresses, on which the safe delivery of the Journal depends.

Adgate, M., 1/o Syracuse; Naugatuck, Conn., U.S.A.

Arnott, G. W. Campbell, 1/o King Street East; 114, Victoria Street, Toronto, Canada.

Bloxam, W. Popplewell, 1/o India; 73, Walpole Road, Boscombe, Hants.

Boyes, Herbert J. S.; Journals to Alameda Barão de Piracicaba, Sao Paulo, Brazil.

Cayvan, L. L., 1/o Hôtel Normandie; 19, West 17th Street, New York City, U.S.A.

- Clapperton, Jas., jun., 1/o Glasgow; retain Journals.
- Clayton, R. H., 1/o Cheetham Hill; Woodleigh, Blackfield Lane, Kerrel, Manchester.
- Crowther, J.; all communications to South Australian School of Mines, Adelaide, South Australia.
- Fawcett, J. H., 1/o Italy; c/o Bank of Australasia, 4, Threadneedle Street, E.C.
- Filcock, P., 1/o Cumberland House; Sunny Bank, Prestbury Road, Macclesfield.
- Gibb, Thos., 1/o Mount Perry; Wilford, Dornoch Terrace, Brisbane, Queensland.
- Granger, Dr. J. Darnell, 1/o Acton; 25, All Saints' Street, Nottingham.
- Hall, Wm. F. (of Selukwe); retain Journals.
- Harvey, C., 1/o Manor Park; 17, Alloa Road, Goodmayes, Essex.
- Hewitt, A. H. (of Hong Kong); Journals to Springvale, near Gurnard, Isle of Wight.
- Hicks, Edwin F., 1/o New York; c/o P. Blakiston's Son and Co., 1012, Walnut Street, Philadelphia, Pa., U.S.A.
- Jackson, Edw., 1/o Grove Avenue; Ravens Clift, Oxford Road, Moeley, Birmingham.
- Jessop, L. V., 1/o Victoria Park; Holmlea, Woodville Road, Leytonstone, Essex.
- Jones, T. Tolley, 1/o Little Collins Street; Australian Explosives and Chemical Co., Ltd., 138, Queen Street, Melbourne, Victoria.
- Lindmueller, Chas., 1/o Cleveland; c/o United Zinc and Chemical Co., Argentine, Kas., U.S.A.
- Marsden, Dr. Fred., 1/o Leeds; 4, Swinton Grove, Manchester, S.E.
- Mayer, And., jun., 1/o Braddock; 104, St. Mark's Avenue, Brooklyn, N.Y., U.S.A.
- Meyer, Aug. R.; Journals to c/o United Zinc and Chemical Co., Kansas City, Mo., U.S.A.
- Proctor, C.; all communications to 27, London Road, Forest Hill, S.E.
- Runtig, D. A.; all communications to Moreland Grove, Coburg, Melbourne, Vic., Australia, Analyst.
- Scrymgeour, Wm., 1/o Kalgoorlie; Fraser's Gold Mine, Southern Cross, West Australia.
- Stevens, Dr. Henry P., 1/o Ash; Laboratory, 15, Borough, London Bridge, S.E., Analytical and Consulting Chemist.
- Sturrock, Capt. G. C.; Journals to Aruvankad, Nilgiris, India.
- Warner, A. R., 1/o London; c/o North West Soap Co., Ltd., 63, Garden Reach, Calcutta, India.
- Wilson, Gordon; Journals (temporary) to Promontorio, Estacion Chinacates, Durango, Mexico.

MEMBER OMITTED FROM LIST.

1900. Garrigues, W. E., 66, Beaver Street, New York City, U.S.A., Chemical Engineer.

Death.

- Allen, Alf. H., Broomfield Road, Sheffield. July 14.

New York Section.

CORRECTION.

ANALYSIS OF COMMERCIAL ACETATE OF LIME.

BY W. M. GROSVENOR, JUN.

(This J., May 31, 1904, 530—535.)

The author desires to state that when he referred to the Distillation Method as having been originated by Fresenius and modified by Stillwell and Gladding, he was unaware that the method was really first devised by Dr. H. Endemann in 1874 and published in Dr. Waly's "Industrial Record" in 1875. It may also be found in Prof. Chandler's "American Chemist" for 1876.

Obituary.

ALFRED H. ALLEN, F.C.S., F.I.C.

ORIGINAL MEMBER OF THE SOCIETY OF CHEMICAL INDUSTRY. ALSO MEMBER OF PUBLICATION COMMITTEE, AND FORMERLY MEMBER OF COUNCIL.

Alfred Henry Allen, born at Southwark, London, on January 17th, 1846, was the son of George Allen, an eminent architect. He was educated at a private school in Brighton, and subsequently became a student at the College of Chemistry and Agriculture at Kennington, under the late Mr. John Nesbit, and at the Royal College of Chemistry and School of Mines under Hofmann and Tyndall. He studied metallurgy and practised assaying under Percy, and attended geology and mineralogy classes at University College, London, under Morris. He began his professional career as assistant to the late Dr. A. H. Hassall, but resigned that position in order to go to Sheffield as analytical assistant to the late Dr. James Allan. On the death of the latter Allen became the residuary legatee, and, though very young, resolved to continue the practice on his own account. Later on, he was appointed lecturer in chemistry and physics at the Sheffield School of Medicine, then situated in Surrey Street, and also lecturer on chemical and physical science at Wesley College. He was President of the Society of Public Analysts in 1887 and 1888, and was also an original Fellow and a Member of Council of the Institute of Chemistry. He served for four years on the Council of this Society, and, from 1888 up to his death, on its Publication Committee.

In 1873, when the Sale of Food and Drugs Act came into operation, Allen was made public analyst to the Corporation of Sheffield and also to the West Riding of Yorkshire. These appointments, together with similar ones in connection with other boroughs, he held up to the time of his death. Always a conscientious and impartial officer, he prided himself on the fact that no one had ever been unjustly punished through his evidence.

In the revision of the Foods Acts, &c., Allen gave evidence before several Royal Commissions and Departmental Committees. Amongst these may be mentioned the Select Committee on British and Foreign Spirits, the Commission on Arsenical Poisoning, the Departmental Committee on Beer Materials, and the Board of Agriculture Departmental Committee on Milk and Cream. In the last-mentioned case the standard ultimately fixed was that advocated and used by him for many years. When the consideration of butter substitutes resulted in the passing of the Margarine Act,

it was at his suggestion that the title "margarine" was adopted. The Danish Government many years ago invited him to inspect the farms and inquire into the whole question of butter production in Denmark. The results of his investigation are embodied in his report to that Government.

During the epidemic of lead poisoning in Sheffield, fifteen years ago, Allen did an enormous amount of special work connected therewith. His theory as to the cause of the action of Sheffield water on the lead service pipes proved to be correct, and his simple method of preventing further mischief, by the addition of chalk to the water of the reservoirs, is in use at the present time.

Always busy with the affairs of his many offices, he yet found time to devote to scientific research, and has left after him a monumental work, which will serve to keep his name in respectful and grateful remembrance. Many important papers were contributed by him to this and other scientific journals, but their contents represent only a fraction of the extensive original work carried out for and published in his great undertaking just referred to, the eight volumes of his treatise on Commercial Organic Analysis, which has long been accepted as a standard work by chemists everywhere. It should never be forgotten that this invaluable treatise, so admirable in its arrangement, so accurate in its facts, and so generally reliable in its statements, is very much

more than a handy and useful compilation from the published works of other chemists, containing as it does on every page the evidence of its author's thought and investigation. Having in mind what he accomplished in developing and systematising commercial organic analysis, it will assuredly be felt by many that he might well be styled the Fresenius of that large branch of chemical analysis.

Another example in this direction may be found in his valuable work on the "Chemistry of Urine," published in 1895. It was written in great measure, so its author informed the writer, as the outcome of an earnest study of the dread complaint (diabetes) which was undermining his own health and powers. In the preface to this work he makes pathetic reference to the subject.

Many will remember how much A. H. Allen's genial presence and powers of entertainment were in request at the social gatherings of the Annual General Meetings in the earlier years of the Society, and what a pervading sense of the incompleteness of those social gatherings in later years was caused, when ill-health enforced his absence from them.

Allen's mental characteristics were a wonderful memory, great keenness of intellect, and ability for rapid grasp of intricate questions. His name will ever be honourably identified with most of the legislation for securing pure food and drugs for the people.

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PATENT SPECIFICATIONS may be obtained by post by remitting as follows:—

English.—8d. each, to the Comptroller of the Patent Office, O. N. Dalton, Esq., Southampton Buildings, Chancery Lane, London, W.C.

United States.—1s. each, to the Secretary of the Society.

French.—1 fr. 25 c. each, to Balin et Cie., 58, Rue des Francs-Bourgeois, Paris (3°).

I.—PLANT, APPARATUS AND MACHINERY.

Sodium Hydroxide; Formation of — from Sodium Carbonate in Boilers fed with Water containing the latter. J. Brand. Z. ges. Brauw., 1904, 27, 456—458.

A well-water containing 23.5 parts of sodium carbonate in 100,000 was employed as boiler feed water. At the end of 14 days an incrustation appeared on the fittings, consisting of 84.8 per cent. of sodium carbonate, 1.6 per cent. of sodium hydroxide, 5.48 per cent. of sodium sulphate, and 7.36 per cent. of water. In 45 days the incrustation

attained such dimensions that injury to the boiler was feared, and the water was therefore mixed in equal proportions with one containing alkaline earth carbonates (16° of hardness). After another week the water in the boiler was examined, and was found to contain 1,667 parts of solids per 100,000 parts, including 1,176 parts of sodium carbonate, 362 parts (21.7 per cent. of the total) of sodium hydroxide, and 100 of sodium sulphate. The sediment deposited from the slightly turbid sample consisted solely of calcium and magnesium carbonates. The probable explanation of the formation of sodium hydroxide is that

under the high temperature and pressure in the boiler, the magnesium carbonate present is converted into hydroxide, which reacts with the sodium carbonate, the double decomposition being continually repeated; or, it may be that, as stated by Küster and Grütters (this J., 1903, 417), the sodium carbonate parts with its carbon dioxide under certain relative conditions of tension and partial pressure.—C. S.

ENGLISH PATENT.

Centrifugal Machines [Separators] and the like. A. J. Boulton, London. From the Firm F. Meyer's Sohn, Taugmünde, Prussia. Eng. Pat. 15,862, July 17, 1903.

SEE Fr. Pat. 334,041 of 1903; this J., 1904, 14.—T. F. B.

UNITED STATES PATENT.

Granular Materials; Apparatus for Washing — G. M. Hoffman and J. T. Gibson, New York. U.S. Pat. 762,309, June 14, 1904.

In order to clean filtering material, such as sand, it is forced by suitable means, together with water, into a hopper working in an immersion pit, and provided with air-lift mechanism, and delivered into a second hopper. The second hopper is provided with an immersion pit and air-lift apparatus, has an overflow for the water, and means for adding additional wash-water to the second immersion pit.—L. F. G.

FRENCH PATENTS.

Muffle Furnace; Circulating — E. Ufenast. Fr. Pat. 340,045, Jan. 30, 1904.

The furnace is embedded in the ground, and not arched, being covered in at the top with firebricks. Coal is fed through holes in the roof on to grates of firebrick, and the products of combustion are made to circulate through longitudinal and transverse passages, and to play around the central muffle on all sides. The circulation is regulated and effected by suitable screens, and the coal gases are led away by an iron pipe from the top of the furnace.—L. F. G.

Filters; Method of Constructing — Berlin-Anhaltische Maschinenbau Akt.-Ges. Fr. Pat. 340,147, Feb. 3, 1904.

SEE Eng. Pat. 15,948 of 1903; this J., 1904, 600.—W. H. C.

Dryer; Cylindrical — for the Direct Heating of Substances in a Continuous Current [of Gas]. M. Hecking. Fr. Pat. 340,260, Feb. 8, 1904.

SEE Eng. Pat. 25,209 of 1903; this J., 1904, 13.—T. F. B.

II.—FUEL, GAS, AND LIGHT.

Illuminating Gas; Condensation of — H. G. Colman. J. Gas Lighting, 1904, 86, 760–763.

In this paper attention is chiefly devoted to a consideration of the function of condensers as scrubbers in which the gas is subjected to the washing action of the liquid products separating from it during the process of cooling, and of the best means of carrying out most efficiently the objects of condensation, namely, to cool the gas to atmospheric temperature and at the same time to retain in it as much of the lowest boiling tar constituents as can be permanently carried during distribution, and to effect as complete a removal as possible of naphthalene and all higher boiling substances. In the analogous process of fractional distillation, where the vapours evolved on boiling a mixed liquid are subjected to fractional condensation to remove higher boiling constituents, the principle universally adopted is to allow the products separating in the still-head to flow backwards against the current of ascending vapour, and it is therefore contended that the same process is also the most suitable in condensing illuminating gas. In the latter case, however, the conditions differ in several respects from those existing in fractional distillation. The vapours are there diluted with large volumes of permanent gases, thus lowering the rate at which the solvents act upon the vapours present; water is also continuously condensing, and, as it does not mix with the tar, tends to form a coating over it, and prevents the latter acting upon the gas. Further,

owing to the rapid cooling which takes place in the early stages after the gas leaves the retort, large quantities of the tar separate as a fog, a considerable portion of which is carried forward mechanically with the gas right through the condensing apparatus, and must be removed as soon as possible, if the above counter-current system is to be fully carried out. In order to effect this removal the author proposes to treat the hot gas as it leaves the hydraulic or foul main, in a modification of the "cyclone dust collector," by means of which these heavy tar particles are removed. The apparatus consists of a short, wide cylinder, to the bottom of which is fixed an inverted cone, the tar flowing away from the lowest portion of the latter by means of a seal pot or siphon. The gas enters the cylinder at a tangent, takes a spiral course through the apparatus, and leaves by means of the outlet main fixed in the centre of the cylinder. Owing to the whirling motion thus set up the heavy solid and liquid particles are driven by centrifugal force to the circumference of the cylinder and cone, where they coalesce and flow away through the siphon. This apparatus, as erected at the Tottenham Gas Works, effects a practically complete removal of the tar-fog from the hot gas; the quantity of tar thus separated amounted to 2 galls. per ton of coal carbonised, or one-fifth of the total tar production. When the separator is at work the quantity of tar condensing during the subsequent cooling stages only amounts to about one-third of a gallon per ton, and is a thin liquid containing a much higher proportion of low-boiling constituents than ordinary coal-tar. The results obtained so far indicate that when the heavy tar-fog is removed from the hot gas in this manner, the gas after cooling contains a larger quantity of benzene and toluene and less naphthalene than is the case when the centrifugal separator is not employed.—H. G. C.

Formaldehyde; Presence of — in the Products of Combustion of Ordinary Fuels. A. Trillat. Comptes rend., 1904, 138, 1613–1615.

Air, carefully freed from any trace of formaldehyde, was passed over burning combustibles in a heated tube, and the products were collected and examined for formaldehyde. In all cases (coal, peat, various woods or products of their distillation, papers, pure cellulose, cork, india-rubber, tobacco) formaldehyde was found, in amounts varying from 1/10,000 to 1/100,000 of the weight of substance burnt. Wood and cellulose gave the largest amounts. The benzene hydrocarbons also yielded formaldehyde, in amounts increasing with their complexity. In all cases the materials with which the combustible materials are in contact affect the yield of formaldehyde considerably; copper, for example, favours its production much more than porcelain. The existence of formaldehyde in the atmosphere is no doubt attributable to its formation in combustions.

—J. T. D.

Briquettes; Determination of Proportion of Binding Material in — E. J. Constam and R. Rougeot. XXIII., page 764.

Gases containing Hydrogen; Fractional Combustion of — by Means of Heated Palladium Wire. F. Richardt. XXIII., page 764.

ENGLISH PATENTS.

Liquid Fuel; Impts. in Furnaces Heated by — A. Barron, Mexboro'. Eng. Pat. 15,726, July 16, 1903.

The liquid fuel is blown in by compressed air, and to secure greater heat the flame passage is made longer than usual and flared towards the interior.—C. S.

Carburetted Water-Gas; Apparatus for the Manufacture of — W. H. Addicks, New York. Eng. Pat. 10,123, May 3, 1904.

SEE U.S. Pat. 758,882 of 1904; this J., 1904, 602.—T. F. B.

Gas; Manufacture of — H. W. Woodall, Wimborne, and A. McD. Duckham, Upper Parkstone, Dorset. Eng. Pat. 16,497, July 27, 1903.

COAL is distilled continuously in a vertical retort, the lower, open end of which dips into a water sump, from which the

coke is removed continuously by means of a conveyor. The steam produced, passes up through the retort, forming water-gas, which is either led off along with the coal-gas or drawn off separately. The retort is heated most intensely at its upper end, by means of combustible gas, the products of combustion being led down a flue surrounding the retort, so as to maintain the coke at a high enough temperature to decompose the steam. Coal is fed into a little shoot within the top of the retort, by means of a rotating gas-tight feeding drum, in such a manner that the shoot and the retort are always full of coal. The position of the bottom of the shoot determines the top level of the coal in the retort. The gas is drawn off from the top of the retort as usual.—H. B.

UNITED STATES PATENTS.

Fuel; Manufacture of Artificial — by Distillation. J. T. Davis, San Francisco. U.S. Pat. 763,267, June 21, 1904.

A MIXTURE of crude petroleum and fine carbonaceous material is agitated and exposed to a continuously increasing degree of heat, so as to distil off the lighter hydrocarbons and leave the heavier hydrocarbons associated with the carbonaceous material. After cooling, the combustible residuum is pressed.—H. B.

Gas Furnace; Regenerative — E. Derval, Paris. U.S. Pat. 762,578, June 14, 1904.

THE furnace is fitted with inclined retorts, each of which is built up of curved sections so arranged that each section is at an angle to the horizontal less than that of the next adjoining section above.—H. B.

Gas Producer. L. Wilson, Glasgow. U.S. Pat. 762,568, June 14, 1904.

THE combustion chamber of the producer is formed of a casing, the lower half of which has a refractory lining. This is surrounded by an outer lined casing, an annular space being left between the inner casing and the lining of the outer casing. Within the annular space is a duplicate coiled pipe for supplying heated air and superheated steam to the combustion chamber. Midway up the combustion chamber there are provided lateral exit pipes, through which the hot gases are led into the annular space, and the gases are finally drawn off at the top of the said space.—H. B.

Water-Gas Generator. D. McDonald, Louisville, Ky., U.S.A. U.S. Pat. 763,313, June 21, 1904.

THE generator is provided laterally at its upper end with a short vertical stack, which communicates with the superheater and contains two flues communicating with the interior of the generator at two different levels in its upper part. By means of a rotatable valve at the top of the stack, either of the two flues may be put in connection with the superheater.—H. B.

Coke Oven; Electric — M. R. Conley, New York. U.S. Pat. 763,368, June 28, 1904.

ELECTRIC resistance plates are arranged in pairs in the inner wall of the furnace body (which is of non-conducting material), and on different horizontal planes, in order to form a series of heating zones. The oven is open at the top, and is closed at the bottom by swing doors which open to the full sectional area of the oven.—C. S.

Coke; Process of Making — M. R. Conley, New York. U.S. Pat. 763,369, June 28, 1904.

THE coal is introduced into an essentially air-tight oven (see previous abstract), which is heated by electrical resistances to a temperature higher than that of the ordinary coke oven.—C. S.

FRENCH PATENTS.

Illuminating Gas; Manufacture of — B. Duttonhofer. Fr. Pat. 340,055, Jan. 30, 1904.

FOR the prevention of the formation of tar and "graphite," steam is passed into the coal in the retorts from the

beginning of the distillation. It is claimed that the hydrogen supplied in the form of steam in this way combines with the carbon to produce hydrocarbons.—H. B.

Combustible Gas from Pulverised Combustibles; Process and Apparatus for the Production of — G. Marconnet. Fr. Pat. 340,075, Feb. 1, 1904.

A MIXTURE of air and finely-pulverised combustible is aspirated in regulated quantities by each suction of the motor (or other apparatus to be supplied with the gas) into a shoot similar to that described in Fr. Pat. 337,514 (this J., 1904, 484), wherein the fuel is burned during its downward passage. From an ashbox at the foot of the shoot the gas produced is led off to the motor, a portion of this gas being withdrawn to feed the burners in the combustion shoot. The device for producing the mixture of air and combustible consists of a vertical pipe having a hopper at the top, from which the powdered fuel descends in a continuous stream. The pipe is connected on one side with the combustion shoot, and on the other with an air-supply pipe. At each suction of the motor, the air rushing through the descending stream of fuel carries over a determinate quantity into the shoot in the form of a cloud. The excess of fuel which accumulates at the foot of the vertical pipe is transferred to the hopper from time to time.—H. B.

Briquette Fuel; Process of Manufacturing — V. Conti and A. Levy. Fr. Pat. 340,244, Feb. 6, 1904.

THE binding material employed to agglomerate the fuel (coal, lignite, wood, peat, spent tan, &c.) is magnesium oxychloride, in the proportion of about 8 per cent. To facilitate the volatilisation of the oxychloride it is mixed with 3 per cent. of its own weight of potassium bichromate, or double that quantity of sodium bichromate or potassium nitrate. The product is compressed and dried in the usual manner.—C. S.

Carbon or Fuel; Artificial —, and *Method of Manufacturing same.* J. Auguot. Fr. Pat. 338,776, May 1, 1903.

THE ingredients of the product consist of powdered fuel materials, with a large proportion of petroleum or other mineral oils, the volatility of which is almost entirely nullified by an admixture of sodium oleomargarate, or of white soap in association with asphaltum or pitch. The following approximate proportions are given:—Crude petroleum, 50 parts; sodium oleomargarate, 6; asphaltum, 25; sawdust, 5; coal dust, 30 parts. The first three are incorporated by heating and continued stirring, and the sawdust and coal dust are afterwards stirred-in in succession.—C. S.

Siemens Regenerative Furnaces; Process and Apparatus for Avoiding Loss of Gas in — A. Kurzwehnart. Fr. Pat. 340,332, Jan. 25, 1904.

SEE Eng. Pat. 1890 of 1904; this J., 1904, 434.—T. F. B.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM, AND MINERAL WAXES.

Mineral Oil Industry in the Lüneburger Heide. Häpke. Chem.-Zeit., 1904, 28, 618—619.

THE occurrence of mineral oil at Wietze, a village standing on the small river of the same name in the neighbourhood of Celle, Hanover, has been known since the middle of the seventeenth century, but the first borings were not made till the end of the year 1880. The production of mineral oil at Wietze amounted in 1903 to more than 40,000 metric tons, of a value of about 3,200,000 M., whilst that of Ölheim was about 750 tons, of a value of 60,000 M. The oil occurs in two different zones, the upper one extending to a depth of 250 m. and the lower one to a depth of 350 m. The oil from the upper zone is thick, of a dark brown colour, sp. gr. 0.935—0.950, and is usually accompanied by a strong brine containing some magnesium chloride. (On

distillation it yields:—Benzine, sp. gr. 0.725, 0.5 per cent.; colourless kerosene ("petroleum"), sp. gr. 0.80, 6.0; kerosene with a faint yellowish tinge, sp. gr. 0.84, 6.0; spindle oil, 20.0; machine oil, 44; tar, 10.0 per cent. The tar on redistillation yields 70 per cent. of an oil containing paraffin, and 30 per cent. of coke. After separation of the benzine and kerosene, the machine oils are used almost exclusively as a wagon-grease. The oil from the lower zone is dark green in colour and has the sp. gr. 0.885. On distillation it yields:—Benzine, sp. gr. 0.701 at 15° C., 1 per cent.; ligroin, sp. gr. 0.727–0.730, 2–3; naphtha and kerosene ("petroleum"), 28; lubricating oil, 47; residue, 17; and loss, 4–5 per cent.—A. S.

"Naphtha" [Crude Petroleum] and Gas at Berekei (Daghestan); Examination of the —. K. Charitschkoff. J. russ. phys.-chem. Ges., 1904, 36, 321–326; Chem. Centr., 1904, 1, 1627.

THE deposit at Berekei has been worked for only a short time. The crude petroleum appears to be of good quality. It is characterised by its high content (86 per cent.) of light fractions ("petroleum"), its low content of middle fractions, and the relatively low viscosity of the residue. The residue has a calorific value of 10,520 calculated by Mendelejeff's formula; it contains no paraffin. The gas which accompanies the petroleum contains, when freed from air, 12.82 per cent. of carbon dioxide, 65.84 per cent. of methane, and 19.92 per cent. of ethane.—A. S.

Aluminium Magnesium Hydrosilicate [Florida Fullers' Earth]; Decolorisation of Oils with —. Hirzel. XII., page 755.

Thiophene Reaction with Nitrososulphuric Acid. C. Liebermann and B. Pleus. XXIII., page 763.

ENGLISH PATENT.

Saturators for Sulphate of Ammonia. M. Schwab, London. Eng. Pat. 17,585, Aug. 18, 1903.

"THE body of the saturator is formed by taking a four-sided piece of lead, and uniting two edges together to form a cylindrical or tubular member," one end of which is beaten into a dome to form the top. "A second sheet of lead is then joined to the two sides of the cylinder so as to form a fender, and a third sheet is joined to the bottom of the fender and body to form the bottom of the saturator. An aperture is formed or cut in the front part of the body facing the fender, making a passage between the fender and the body," "producing an apron or midfeather out of that portion of the body facing the fender." The usual connections and manhole may be formed in the dome.

—E. S.

UNITED STATES PATENT.

Fuel; Manufacture of Artificial — by Distillation. J. T. Davies. U.S. Pat. 763,267, June 21, 1904. II., page 745.

FRENCH PATENTS.

Meta-Cresol; Process for Producing — from Crude Cresol. Chem. Fabr. Ladenburg G. m. b. H. Fr. Pat. 339,880, Jan. 25, 1904. XX., page 759.

Shale Oil and Similar Substances; Treatment of —. A. Adiasewich. Fr. Pat. 340,354, Feb. 10, 1904. Under Internat. Conv., Feb. 25, 1903.

See Eng. Pat. 4431 of 1903; this J., 1904, 247.—T. F. B.

IV.—COLOURING MATTERS AND DYE STUFFS.

Natural Dye stuffs still used in Dyeing, and their Valuation. von Cochenhausen. Z. angew. Chem., 1904, 17, 874–886.

A LONG paper on the dyeing properties and methods of valuation of the chief natural dye stuffs still used in dyeing operations.—A. B. S.

Rosanilines; Additive Ammoniacal Compounds of —. J. Schmidlin. Comptes rend., 1904, 138, 1709–1711.

THE mon-acid salts of rosanilines absorb 4 mols. of ammonia gas, producing colourless substances, apparently similar to those formed when the tri-acid salts (this J., 1904, 710) absorb a fourth molecule of hydrochloric acid gas. These ammoniacal compounds are entirely additive, and lose all their ammonia in *vacuo*. The author concludes that the mon-acid rosaniline salts are unsaturated molecules, and that the free affinities are chemically neutral, and can be satisfied by bases or by acids. No doubt the carbon—a neutral element—is the seat of these unsaturated affinities, which appear to be satisfied by 4 mols. of either HCl or NH₃. —J. T. D.

Azo Dye stuffs derived from 2:2-Dinaphthol. M. E. Pozzi-Escot. Comptes rend., 1904, 138, 1618–1619.

THE existence of azo-derivatives of β : β -dinaphthol is strong evidence in favour of the linkage between the two naphthol nuclei being in the 3:3- and not in the 1:1-position, as has been supposed. The azo dye stuffs obtained have no practical interest, although, in an acid bath, they dye wool a more or less deep red shade.—T. H. P.

Cyanomac lurin. A. G. Perkin. Chem. Soc. Proc., 1904, 20, 170.

CYANOMAC LURIN (Chem. Soc. Trans., 1895, 67, 937), which exists in jackwood (*Artocarpus integrifolia*) in conjunction with morin, crystallises from water in the anhydrous form, and is now shown to be isomeric with the catechins, C₁₅H₁₄O₆. On fusion with caustic alkali, cyanomac lurin gives β -resorcylic acid (not cresorcylic acid as previously suggested) and phloroglucinol, and with pine wood acid hydrochloric acid it resembles the catechins in giving the phloroglucinol reaction. With boiling dilute hydrochloric acid, a brown amorphous compound is produced; this is identical in appearance with the so-called fourth anhydride from Gambier catechin, and has the same percentage composition. Cyanomac lurin thus appears to represent a catechin in which the catechol nucleus is replaced by resorcinol.

Catechins; Note on the —. A. G. Perkin. Chem. Soc. Proc., 1904, 20, 171.

IN a previous communication (Trans., 1902, 81, 1160) it was pointed out that whereas Gambier catechu contains a catechin, C₁₅H₁₄O₆ (m. pt. 175°–177°), the pentabenzoyl derivative of which melts at 151°–153°, yet a catechin, C₁₅H₁₄O₆, which was isolated from *Acacia catechu* melted at 204°–205°, and gave a benzoyl compound melting at 181°–183°. It is now found that the acacia catechin gives an acetyl derivative, C₁₅H₁₀O₆(C₂H₃O)₂, forming colourless needles (m. pt. 158°–160°), and a tetramethyl ether, C₁₅H₁₀O₆(OCH₃)₄, separating in colourless prisms (m. pt. 152°–153°). The corresponding substances from the Gambier catechin (Kostanecki and Tambor, this J., 1902, 854) melt at 129°–130° and at 142°–143° respectively. For acacia catechin the name "*acacatechin*" is proposed.

Indigo; Constituent of Java —. A. G. Perkin. Chem. Soc. Proc., 1904, 20, 172.

RAWSON (this J., 1899, 251) has shown that Java indigo contains a yellow colouring matter. This substance, C₁₅H₁₀O₆, forms yellow needles, melts at 276°–277°, and gives an acetyl compound, C₁₅H₈O₆(C₂H₃O)₂, which separates in colourless needles, and melts, when crystallised from methyl alcohol, first at 116°–120° and subsequently at 181°–182°. The colouring matter is identical with kampherol (Chem. Soc. Trans., 1902, 81, 587).

Indigo; Our present Knowledge of the Chemistry of —. W. P. Bloxam. Chem. Soc. Proc., 1904, 20, 159–160.

AS the determination of the maximum amount of indigo obtainable at each successive stage of its preparation ("mahai") and of the quantity present in the leaf of the green plant depends on the purity of the indigotin employed as a standard, the author has estimated the percentage of nitrogen in the best specimens procurable, and has thus

found that they contain only about 90 per cent. of indigotin. Since the pure substances could not be prepared by the action of solvents on cake indigo or the synthetical product, the crude indigo was sublimed under diminished pressure, and in this way a well-crystallised product was readily obtained which gave the percentage of nitrogen required for indigotin. This pure material, when sulphonated and subjected to analysis by the permanganate method, was found to give values ranging up to 300 per cent. of the weight of substance taken. As this method is used in ordinary technical analyses of indigo, this result explained the extraordinary variations observed in the published values given for cake indigo and the products obtained during the successive stages of the manufacture ("mahai"). It has also been found that the red substance occurring in the cake obtained from plant-indigo, and known as "indirubin" or indigo-red, is not, as stated, a derivative of indigo, as it contains no nitrogen. This material, which may consist of a mixture of compounds, will be further investigated.

ENGLISH PATENTS.

Acridine Series; Manufacture of Colouring Matters of the — [Acridine Dyestuffs]. J. Y. Johnson, London. From Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, Germany. Eng. Pat. 17,768, Aug. 17, 1903.

SEE U.S. Pat. 746,981 of 1903; this J., 1904, 57.—T. F. B.

Sulphide Dyestuffs; Manufacture of —. A. Meyenberg and The Clayton Aniline Co., Manchester. Eng. Pat. 17,805, Aug. 17, 1903.

DINITROPHENOL is heated in the presence of excess of hydrogen sulphide, or else a stream of hydrogen sulphide is passed through a boiling solution of the sodium salt of dinitrophenol in water. The water is distilled off, and the product, after drying, is ready for use.—A. B. S.

Anthracene Series; Manufacture of New Derivatives of the — [Anthracene Dyestuffs]. H. E. Newton, London. From Farbenfabr. vorm. F. Bayer & Co., Elberfeld, Germany. Eng. Pat. 17,965, Aug. 19, 1903.

SEE Fr. Pat. 334,658 of 1903; this J., 1904, 113.—T. F. B.

Indoxyl or its Homologues; Manufacture of —. O. Imray, London. From Farbwerke vorm. Meister, Lucius und Brüning, Höchst-on-the-Maine, Germany. Eng. Pat. 18,131, Aug. 21, 1903.

SEE Addition, of Aug. 24, 1903, to Fr. Pat. 317,121 of 1901; this J., 1904, 114.—T. F. B.

UNITED STATES PATENTS.

Sulphur Dye [Sulphide Dyestuff]; Blue —, and Process of Making same. E. Mathe, Assignor to Farbwerke vorm. Meister, Lucius und Brüning, Höchst-on-the-Maine, Germany. U.S. Pat. 763,193, June 21, 1904.

Di-*p*-hydroxy-*p*-*p'*-diaminodiphenylamine is heated at 100°–120° C. with sodium sulphide and sulphur. The product dyes cotton from a sodium sulphide bath indigo-blue shades.—E. B.

Anthracene Dye, and Process of Making same. H. Weltz, Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, Germany. U.S. Pat. 763,233, June 21, 1904.

THE dyestuff in question is obtained by condensing a polyhydroxyanthraquinone sulphonic acid with ammonia. It dissolves in hot water with a reddish-violet colour.—E. B.

Sulphur Dyes [Sulphide Dyestuffs]; Process of Making —. A. F. Poirrier, Assignor to Soc. Anon. des Mat. Col. et Prod. Chim. de St. Denis, Paris. U.S. Pat. 763,320, June 21, 1904.

SEE Addition, of May 19, 1903, to Fr. Pat. 292,400 of 1899; this J., 1903, 1241.—T. F. B.

Tetrazo Dye; Orange —, and Process of Making same. K. Jedlicka and A. Schedler, Basle, Assignor to Soc. Chem. Ind., Basle. U.S. Pat. 763,761, June 28, 1904.

SEE Eng. Pat. 27,630 of 1903; this J., 1904, 249.—T. F. B.

FRENCH PATENTS.

Monazo Dyestuffs; Manufacture of —. Soc. Anon. des Prod. F. Bayer and Co. Third Addition, dated Nov. 27, 1903, to Fr. Pat. 323,808 of Aug. 18, 1902.

THE diazo derivatives of the *o*-aminophenolsulphonic acids or of their derivatives are combined with 1.5-aminonaphthol in acid solution. The resulting dyestuffs dye wool from an acid bath in various shades, ranging from violet to reddish-violet, many of which are converted into very fast blacks by an after-treatment with bichromate. The colours before chroming are usually violet or reddish-violet.

—A. B. S.

Basic Dyestuffs; Production of New —. Fabr. Bâloise de Prod. Chim. Fr. Pat. 340,130, Feb. 2, 1904.

THE rhodamine bases of either the phthalic or succinic series are heated with halogen derivatives of fatty acids, e.g., chloracetamide, either alone or in the presence of a diluent, as alcohol or glycerin. The dyestuffs can be precipitated from aqueous solution in the usual way by means of common salt.—A. B. S.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

Half-Silk Dyeing; Two-Colour Effects in —. A. Sander. *Färber-Zeit.*, 1904, 15, 197.

TO increase the affinity of the cotton for the dyestuffs, it is soaked for 10 minutes in a solution of sodium hydrate, 36° Tw., containing 100 c.c. of glycerin per litre, washed, acidified in a solution containing 50 c.c. acetic acid per litre, washed, and dyed. The cotton is dyed with sulphide dyestuffs at about 70° C. with the usual additions; some casein is added to prevent the colour staining the silk. The material is then washed and the silk dyed with suitable acid or other dyestuffs.—A. B. S.

Dyeing Process; Study of the Direct — and of the Felting of Wool. E. Justin-Mueller. *Bull. Soc. Ind. Rouen*, 1904. *Chem.-Zeit.*, 1904, 28, Rep. 199–200.

THE author regards the textile fibres as bodies of a colloidal nature, and arrives at the following conclusions with regard to their behaviour in the direct dyeing and felting processes. (1) Explanation of the effect of wetting the wool before steaming, in wool printing. Colloidal bodies only take up foreign substances when they are wet, or in the gel condition or one approximating thereto. Thus the wool takes up the dyestuff satisfactorily, only when it is wet; moreover, on steaming, the wet wool swells, and the dyestuff is converted by the moisture and steam into a dissolved condition, whereby its absorption is favoured. (2) In dyeing wool in an acid bath, the acid tends to convert the wool into the gel condition, in which it has much greater absorptive power for dyestuffs. That this is actually the case is readily perceived if in dyeing woollen yarn, the boiling is prolonged, or too much acid is added; the yarn then becomes felted together, i.e., it approaches the gel condition. (3) *Felting Process*: The wool and hair fibres are converted into the gel condition by the preliminary treatment, or by the acid or alkaline "fulling"; then, by the mechanical action during the milling, the fibres in the gel condition become felted together. (4) The greater affinity of mercerised cotton for dyestuffs is also due to the tendency of the caustic soda to convert the cotton into the gel condition.

—A. S.

Printing Tissues; Application of the "Three-Colour Process" in Engraving Rollers for —. M. J. Witwiski. *Z. Farben- u. Textil-Chem.*, 1904, 3, 237—241.

MUCH retouching of the negatives, or of the unetched dies, is necessary in order to obtain, along with secondary and tertiary shades of colour, pure primary hues, in printing with rollers (applying respectively red, blue, and yellow colours) engraved from negatives prepared by photographing richly-coloured designs or natural objects through light-filter colour screens (see this J., 1902, 47; 1904, 184, 560, and 604). Otherwise brownish-grey tones result. The solubility of the colour mixtures employed in tissue printing causes the prints produced to be less successful reproductions than those obtained by lithography, in which insoluble pigments are used, the colours in the fairly open parts running into one another in the former case, while in the latter case they retain to a much greater extent the detached stipple-form in which they are applied. In tissue printing the reproduction of objects in their natural colourings is less sought than their presentation in striking combinations of colour. The author agrees with Pietruszewskij (1) that natural objects cannot be properly depicted by means of three colours only; (2) that the results obtained by mixing colours optically are not identical with those obtained by mixing them in the form of pigments.

—E. B.

Dyeing [Mordanting] Process; P. Heermann's Study of the —. L. Bloch. *Bull. Soc. Ind. Mulhouse*, 1904, 74, 159—166.

The author has repeated a number of the quantitative estimations made by Heermann (this J., 1903, 361 and 623, and 1904, 57 and 438) in his study of the influences of (a) length of time of immersion, (b) temperature and (c) concentration of solution, and (d) basicity of the mordanting salt, upon the absorption of the hydrates of stannic tin, iron, chromium, and aluminium, by raw and by boiled-off silk. Although the results do not exactly accord with Heermann's, the numbers obtained bear the same relations to one another. With regard to the process of mordanting (weighting) silk with stannic hydrate, which is very extensively practised in the silk-manufacturing centres, the author points out that even if it were definitely shown that an economy in tin is realised by the process of successive immersions in dilute baths, as would from Heermann's results appear to be the most advantageous method, there still remains the question whether the economy thus gained is not more than counterbalanced by the greater expense of working which is involved.—E. B.

Antimony Tannate Mordant; Half-Discharge for —. H. Bourry. *Bull. Soc. Ind. Mulhouse*, 1904, 74, 167—169.

To obtain so-called cameo effects upon cotton tissues, these are mordanted with tannic acid and tartar emetic, printed with a mixture of stannous chloride and ammonium sulphocyanide, and over-printed, during the same passage through the printing machine, with caustic soda lye, the stannous chloride mixture acting at the same time as a half-discharge for the mordant and as a resist for the caustic soda discharge. The proportions for the half-discharge mixture recommended by C. Favre and the author are 5.4 litres of starch and gum-tragacanth paste, 4 kilos. of stannous chloride, and 1.5 kilos. of ammonium sulphocyanide. The printed tissues are steamed for a short time, passed through a chalk bath, dyed with basic dyestuffs, washed, soaped, and cleared as usual. Another method for producing somewhat similar effects consists in printing the thickened caustic soda-lye discharge, steaming for 2—4 minutes, and over-printing with a thickened solution of stannous chloride. The tissues are then passed through a chalk bath and dyed, &c. A full discharge is thus obtained in the parts where the caustic soda has been applied, along with a half-discharge in the parts where the stannous salt alone has been printed.—E. B.

Dyestuffs for Wool; New Classes of — and New Reactions of Aldehydes. E. Noeltig. *Bull. Soc. Ind. Mulhouse*, 1904, 74, 171.

THE author considers the reactions recently described by Prud'homme (this J., 1904, 542) novel and interesting. The latter finds that a blue dyestuff is produced when diazotised "Magenta," decolorised with sodium hydro-sulphite, acts upon benzaldehyde. A number of other aldehydes tried by the author act similarly, viz., the three nitrobenzaldehydes, the three hydroxybenzaldehydes, methylaldehyde, *p*-chlorobenzaldehyde, *o*- and *p*-aminobenzaldehyde, benzaldehyde *o*-sulphonic acid, protocatechuic aldehyde, vanillin, isovanillin, methylvanillin, piperonal, and phenylacetaldehyde. All these give blue dyestuffs analogous to that obtained from benzaldehyde.—E. B.

Grease Oleines [Wool Oils] Distilled; Detection of Mineral Oil in —. A. H. Gill and S. N. Mason. *XXIII.*, page 763.

ENGLISH PATENTS.

Wool-washing Machinery; Impts. in —. E. Letenne, Courcoing (Nord), France. Eng. Pat. 5201, March 2, 1904.

THE application to a wool-washing machine "comprising a vat," of a mechanism consisting of combs, is claimed, the "tines" of which combs traverse the bottom of the vat and carry the wool through the water, removing it at length to a carrier-band, without raising it from the water in the process. The mechanism referred to, is described in detail, comprising standards attached to the vat, bearings fitted in these standards and adjustable therein, shafts journaled in the bearings, sprockets carried by the shafts, chains adapted to travel over the sprockets, and the combs depending from the links of the chains referred to. Guide arms and blocks on the links, &c., regulate the position and movement of the combs through the vats.—A. S.

Yarn Bleaching; Appliances for —. W. H. Hoyle and T. Barker, Bolton, England. Eng. Pat. 17,616, Aug. 14, 1903.

THE cotton is bleached as it comes from one of the "intermediate" machines, such as the "slubbing frame," so that it is only slightly twisted. The cotton is wound on perforated vulcanite bobbins, which have a slit in one side, and can be slightly expanded by placing them on the slubbing frame bobbins, which have a key or rib which fits into the slit. When wound, the vulcanite bobbins are removed from the frame bobbins and placed on tapered metal tubes to support them during the usual bleaching process. When the bleaching is complete, the material is dried and the vulcanite bobbins replaced on the slubbing frame bobbins in readiness for the next spinning operation.—A. B. S.

Dyeing, Bleaching, and other Purposes; Methods of and Apparatus for Treating Spun Fibres with Liquids for —. W. Reid, Twickenham. Eng. Pat. 13,556, June 17, 1903.

SEE Fr. Pat. 339,322 of 1904; this J., 1904, 713.—T. F. B.

FRENCH PATENTS.

Ramie and Analogous Textile Materials; Process and Machinery for Decortage and Degumming of —. J. Bendel. Fr. Pat. 338,752, April 15, 1903.

THE strips of raw ramie, after a previous stamping in water, are hung by their middles over a series of horizontal rods fixed in a frame. Each rod full of ramie is covered with a metallic cover fitted with spikes, which stick into the material and catch any fibres broken off in the process. The frame is first placed in a soap-bath containing 1 kilo. of soap per 100 litres of water. After boiling in this for from 10 to 30 minutes, the frame is removed and placed in a washing machine supplied with fine sprays of water, which remove the bark, &c., loosened by the soap bath. This lasts from one to five minutes. The frame is then placed in the degumming bath, where the ramie is treated

for 20 to 25 minutes at 60° C. with a solution containing 5 grms. of soap and $\frac{1}{2}$ grm. of vanadic acid per 100 litres. The ramie is then removed and allowed to dry slowly in the air.—A. B. S.

Degreasing Wool; Machine for —, with Vats Mounted on Inclined Rails. E. Lesenne. Fr. Pat. 340,189, Feb. 8, 1904.

SEE Eng. Pat. 5201 of 1904, under Eng. Pats. preceding these.—T. F. B.

Dyeing Threads on Bobbins; Perforated Tube with Diaphragm for —. L. Dêtré. First Addition, dated Jan. 20, 1904, to Fr. Pat. 333,676, July 10, 1903.

SEE Eng. Pat. 4596 of 1904; this J., 1904, 487.—T. F. B.

Feathers; Process for Preserving —. R. Wolfenstein. Fr. Pat. 338,797, May 11, 1903. Under Internat. Conv., March 7, 1903.

SEE Eng. Pat. 11,712 of 1903; this J., 1904, 439.—T. F. B.

ERRATUM.

This Journal, 1904, 659, column 1, line 30 from bottom, after "Eng. Pat." insert its number, "15,108."

VII.—ACIDS, ALKALIS, AND SALTS.

Sulphuric Acid Chambers; Oblong and Tangential —. T. Meyer. Z. angew. Chem., 1904, 17, 926–929.

A REPLY to Hartmann and Benker (this J., 1904, 488) whose criticisms are considered to be faulty, inasmuch as they compare sets of chambers in the two systems working under totally different conditions. The Abraham circulation, appealed to so strongly by Hartmann and Benker, no doubt exists; but whether, even in an oblong chamber, it is the dominant motion of the gases is very doubtful, and the author considers the undirected whirls observed in a glass model by Porter (and figured in this J., 1903, 476) to represent much more nearly the actual state of things. It is considered that in a tangential chamber, the Abraham circulation must be practically non-existent, or there could not be the distribution of temperatures (wall, top, 63°; bottom, 61°; centre, top, 56° C.) observed by the author. Even did it exist, the resulting cooling by the air-cooled outer walls of the chamber would be quite inadequate to remove the amount of heat required to keep the temperature down to the proper optimum, with such intense working as exists in a modern tangential chamber. The author's condensing tubes are merely a means of getting the best work out of the system—a substitute, and, in the author's view, an advantageous substitute, for more chamber space. The author holds that a tangential chamber can be made relatively higher than an oblong one; and he thinks the advantage of height has nothing to do with the Abraham circulation, but arises from the fact that the condensed droplets of acid have further to fall through the mist in the chamber, and thus in part aid its condensation, and in part help the reaction by change of temperature and by aiding mixture of the gases and the mist. According to Lunge there are two reactions concerned; each of these has its independent "temperature-optimum," and hence temperature-changes through ranges embracing both of these optima will forward the reaction. Height, if the author's view be correct, must be of especial value where water-spray is fed into the chamber; but here also extreme fineness of division of the spray is important.—J. T. D.

Hydrated Chlorides; Behaviour of Typical — when Heated in Hydrochloric Acid Gas. F. A. Gooch and F. M. McClenahan. Z. anorg. Chem., 1904, 40, 24–38.

WHEN a hydrated chloride is heated in air, the products formed may be, according to the temperature and the nature of the chloride, either the anhydrous chloride and water, or hydrochloric acid and the oxychloride, oxide, or hydroxide of the metal. The authors chose three typical hydrated chlorides, viz., barium chloride, $\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$,

which gives off its water without loss of chlorine; magnesium chloride, $\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$, which loses part of its chlorine together with the water; and aluminium chloride, $\text{AlCl}_3 \cdot 6\text{H}_2\text{O}$, which loses the whole of its chlorine in the form of hydrochloric acid together with the water; and examined their behaviour when heated in hydrochloric acid gas. They find that hydrochloric acid has no influence on the dehydration of barium chloride below 100° C. (the temperature at which the chloride is completely dehydrated). It has also practically no influence on the separation of the first 2 mols. of water from magnesium chloride, $\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$ (at about 100° C.); the further dehydration is, however, retarded between 100° C. and 130° C., but accelerated above 130° C. Hydrolytic dissociation of the magnesium chloride is not very considerable below 200° C. The dehydration of aluminium chloride, $\text{AlCl}_3 \cdot 6\text{H}_2\text{O}$, is retarded by hydrochloric acid up to 130° C.; above this temperature, just as above 100° C. in air, water and hydrochloric acid are evolved simultaneously. These differences in the behaviour of hydrated chlorides are satisfactorily explained by the constitutional formulæ proposed by Cushman (Amer. Chem. J., 26, 505), with tetravalent oxygen and trivalent chlorine. According to this view, the mols. of water which are not readily split off occur in the body of the complex molecule, whilst the mols. of water that can be easily removed, occur in the form of side chains.—A. S.

Arsenic Pentachloride; Non-existence of —. W. R. Smith and J. E. Hora. J. Amer. Chem. Soc., 1904, 26, 632–635.

CHLORINE was passed into arsenic trichloride for varying times, so as to obtain products containing, for every atom of arsenic, from 3 to 9 atoms of chlorine. Since the freezing points of these products decrease quite regularly with increasing chlorine content, it is concluded that the substance obtained by passing chlorine into arsenic trichloride at –34° C., and stated to be arsenic pentachloride, is merely a solution of chlorine in the trichloride. (See Baskerville and Bennett, J. Amer. Chem. Soc., 24, 1070.)
—T. F. B.

ENGLISH PATENTS.

Salt; Manufacture of —. H. Tee, Liverpool. Eng. Pat. 8117, April 8, 1903.

IMPURE or discoloured rock salt is melted in covered crucibles, each provided with a horizontal outlet pipe from the bottom, for running off deposited matter, and with another channel a little above the bottom, through which the purified salt may be run. Air, preferably highly heated, is blown through the molten salt for a considerable time, to oxidise the impurities. In some cases, a small proportion of lime, say from 0.1 to 1.0 per cent., is added to assist the separation of the oxidised iron. After settling, the molten clarified salt is run on to cooling floors, and granulated by suitable devices. In a modified process, the salt is melted by gases acting upon its surface, as in a metal reverberatory furnace.—E. S.

Sulphate of a Higher Oxide of Manganese; [Electrolytic] Manufacture of a —. J. Y. Johnson, London. From the Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, Germany. Eng. Pat. 17,981, Aug. 19, 1903.

To obtain "manganese superoxide sulphate" [sulphate of the peroxide of manganese], a solution of manganous sulphate in sulphuric acid is electrolysed at a temperature of about 60° C., a lead cathode in sulphuric acid being used. The anode may be of lead; but if it be of manganese or ferro-manganese, a salt of manganese need not be dissolved in the acid, which is then taken of greater strength than in the former case. Another process consists in treating with "lead superoxide," a hot sulphuric acid solution of manganous sulphate. Or, to stated proportions of powdered potassium permanganate and of sodium sulphite, sulphuric acid of 70 per cent. is added. The required salt may be obtained in a solid form by adding, separately, powdered manganous sulphate and potassium permanganate to hot sulphuric acid of 55 per cent. On cooling, black manganese superoxide sulphate separates.
—E. S.

Saturators for Sulphate of Ammonia. M. Schwab.
Eng. Pat. 17,585, Aug. 13, 1903. III., page 746.

Gas; Process and Apparatus for Separating Mixtures of —, applicable for the Separation of Oxygen and Nitrogen from Liquid Air. Soc. pour l'Exploitation des Procédés Georges Claude, Paris. Eng. Pat. 28,682, Dec. 30, 1903. Under Internat. Conv., Jan. 3, 1903.

SEE Fr. Pat. 828,245 of 1903; this J., 1903, 950.—T. F. B.

UNITED STATES PATENTS.

Nickel Hydroxide; Recovering [from Nickel-Ammonium Chloride] —. H. A. Frasch, New York. U.S. Pat. 763,053, June 21, 1904.

NICKEL-AMMONIUM chloride is subjected to dry distillation in presence of a "dehydrating agent," the ammonia evolved is collected, the residue is dissolved in a suitable liquid, and nickel hydroxide is precipitated. Or the nickel-ammonium chloride is suspended in a solution of calcium chloride, on heating which, a portion of the nickel separates as hydroxide, and the remainder is precipitated from the separated solution by a suitable agent. Ammonia is then recovered from the cleared solution by heating it with calcium hydroxide.

—E. S.

Copper, Sulphate of; Method of Making —. G. Gin.
U.S. Pat. 763,478, June 28, 1904.

SEE Eng. Pat. 5330 of 1903; this J., 1904, 323.—T. F. B.

VIII.—GLASS, POTTERY, ENAMELS.

Porcelains; New Results Obtained in —. F. Garros.
Comptes rend., 1904, 139, 68—70.

THE author describes the properties of "asbestos porcelain," made by firing asbestos. This is particularly suitable for sterilising filters, and the extremities of the author's sterilising bougies which are made from it, while allowing liquid to pass freely, are said to completely retain the finest solid particles, including micro-organisms of all descriptions. A glaze preparation consisting of oxide of tin has been found very suitable for glazing the ends of these surgical bougies, alkaline glazes being too fusible. The degree of porosity of asbestos porcelain can be regulated by the temperature of firing. As this rises, the individual particles of asbestos contract, and the biscuit becomes more and more porous, and at the same time the translucidity increases up to 1400° C. Between this and 1650° C. incipient fusion occurs, with consequent decrease of porosity, but increase of solidity; and above 1650° C. "Asbestos Glass" is formed. Porous plates or cells for accumulators, of asbestos porcelain, exhibit a much lower resistance than other porous vessels; and insulators have been made, standing a firing at 1500°—1600° C., by a mixture of asbestos with an alumino-alkaline paste. The asbestos predominates in the biscuit for these insulators, while the same mixture with excess of the paste forms a most suitable glaze. Such insulators are very strong mechanically, and will bear without leakage very high electrical pressures. Copper can be joined to asbestos porcelain through the medium of the glaze. A new field in ceramics has been opened up, it is stated, by this work, and the author says that, amongst other applications, he has already produced porcelains from magnesia, talc, &c.—J. T. D.

UNITED STATES PATENTS.

Glass; Method of Drawing —. J. A. Chambers, Alleghany, Assignor to Window Glass Machine Co., Pittsburg, Pa. U.S. Pat. 762,879, June 21, 1904.

HOLLOW glass cylinders are drawn by feeding molten glass into a receptacle, chilling the upper layer of the glass, and then lowering a "bait" into the bath, forming a neck and enlarged cap, after which the cylinder is drawn up.

—A. G. L.

Glass Articles; Method of Drawing —. J. A. Chambers, Alleghany, Assignor to Window Glass Machine Co., Pittsburg, Pa. U.S. Pat. 762,880, June 21, 1904.

THE glass articles are shaped by drawing them upwards from a bath of molten glass, and gradually and automatically increasing the speed of the drawing.—A. G. L.

Glass Sheets; Apparatus for Making —. J. Broeger, Greensburg, Pa. U.S. Pat. 763,633, June 28, 1904.

By means of vacuum action, glass from a bath of molten glass is caused to enter a cavity in a sectional head in which an initial portion of the article to be cast is formed. A further portion of glass attached to the initial part is withdrawn from the bath, and means are provided for severing the drawn glass from the mass pendent thereon.

—A. G. L.

IX.—BUILDING MATERIALS, CLAYS, MORTARS AND CEMENTS.

Paving Flags from Destructor Slag; Manufacture of —
The Engineer, July 8, 1894, page 41.

THE Battersea Borough Council have installed a plant for the manufacture of pavement flags from the clinker of their refuse destructor. The slabs are composed of two distinct layers of material, an upper and thinner one, $\frac{1}{2}$ in. thick, consisting of granite refuse dust and cement, and a thicker one made up of a mixture of three parts of clinker and six of cement. The clinker is first ground in a mill and then mixed with the cement and water. The mixture is fed into a mould, given a facing of granite to add the appearance of stone, and subjected to a pressure of 500 tons in a special press similar in pattern to the presses used by other municipal bodies. The slabs are 3 ft. by 2 ft., 2 ft. 6 ins. by 2 ft., and 2 ft. by 2 ft., by 2 $\frac{1}{2}$ ins. thick. Four unskilled men, it is said, can turn out 120 flags in eight hours.—A. G. L.

Gypsum; The Hydration of —. P. Rohland. Thonind.-Zeit., 1904, 28, 942—944.

THE author's experiments lead him to conclude that any substance which, in the condition of a dilute solution, increases the tension of solution (Lösungsdruck) of gypsum, must also accelerate its velocity of hydration.—C. S.

ENGLISH PATENTS.

Lime and Portland Cement; Process of and Machines for Preparing —. T. Winstanley, Formby. Eng. Pat. 16,412, July 25, 1903.

FOR the simultaneous slaking and conveying of lime a number of trays are mounted on an endless conveyor. Lime is placed on these trays, and water is then sprinkled on the lime, after which the trays are moved forwards so as to enter, one or more at a time, a chamber in which they are exposed to the steam generated by the heat evolved during the slaking. Steam may also be admitted from outside if necessary. After leaving this chamber, the trays are moved forwards to a screening apparatus, into which they discharge their contents, the coarser particles being returned to undergo the same operation. The process for hydrating the free lime in Portland cement is the same, except that no water is sprinkled on the trays, the cement being hydrated by moist air in the chamber.—A. G. L.

Asphalt Compositions for Floors and the like. F. Nusch, London. From Westdeutsche Thomasphosphat-Werke, Berlin, Germany. Eng. Pat. 7343, March 28, 1904.

POWDERED slag is added to melted asphalt composition, filling materials, such as sand and gravel; and binding agents, such as tar, resinous products and oil, are added, the whole is boiled and stirred, and then allowed to cool, when a hard elastic product is obtained. Suitable proportions are 80 per cent. of slag, 10 per cent. of asphalt composition, and 10 per cent. of binding and filling materials.

—A. G. L.

UNITED STATES PATENTS.

Marble; Artificial —. D. Feldhamer and N. Oelgiesser, New York, N.Y. U.S. Pat. 763,883, June 28, 1904.

THE artificial marble is composed of a mixture of slaked lime, coal-ashes, zinc-white, chloride of zinc, and chrome-alum saturated with a solution of tartar and borax.

—A. G. L.

Cement derived from Ashes, and Method of Making same. M. W. Marsden, Philadelphia, Pa. U.S. Pat. 763,685, June 28, 1904.

THE cement is made by mixing pulverised coal-ashes and lime, to which unburnt coal may also be added, calcining or fusing the mixture, and powdering the product.

—A. G. L.

Cement; Composition of Matter for —. A. I. Ginter, Newark, New Jersey. U.S. Pat. 763,746, June 28, 1904.

THE cement is composed of 500 lb. of "prince metallic," 50 lb. of japan, 105 lb. of white lead, 3 galls. of varnish, 5 galls. of oil of citronelli, 10 galls. of coal-tar, 1 gall. of naphtha, and 5 galls. of fish-oil. Ground slate may also be added.—A. G. L.

FRENCH PATENT.

Bricks and Agglomerates from Waste Moulding-Sand of Glassworks; Manufacture of —. Blottière. Fr. Pat. 340,282, Feb. 9, 1904.

CEMENT is made from a mixture of 8 parts of chalk, 12 of fireclay, and 80 of waste glassworks sand, or of 12 parts of chalk, 30 of fireclay, and 68 of waste sand. The cement is mixed with an aggregate consisting of quartz, sandstone, firebricks, &c., and the mixture subjected in moulds to hydraulic pressure, varying from 10 or 30 to 350 kilos. per sq. cm., according to the use to which the bricks are to be put.—A. G. L.

X.—METALLURGY.

Metals; Distillation of a Mixture of two —. H. Moissan and O'Farrelley. Comptes rend., 1904, 138, 1659—1664.

MIXTURES of metals were heated in an electric furnace for varying times, and the residues were analysed. In the case of copper and zinc, add copper and cadmium, the zinc and cadmium were completely expelled after very short periods of distillation. In the case of copper and lead, the same ultimate result was reached, though only after a longer distillation, during which the percentage of lead gradually lessened. In the case of copper and tin, some mixtures gradually increased in copper-content, some in tin-content, and some distilled without change of composition. (The latter alloy corresponds approximately to Stead's crystallised alloy, SnCu.) In the case of lead and tin, the lead gradually lessens in amount, pure tin being ultimately left. A remarkable character of tin is the wide range of temperature through which the liquid metal exists; whilst it melts at the low temperature of 226° C., its boiling point is above those of copper and lead. The results of these experiments show that the laws of ordinary fractional distillation apply even in the case of the distillation of mixtures of metals.—J. T. D.

Metals; Passivity of —. W. J. Müller. Z. phys. Chem., 1904, 48, 577—584.

THE view that the passive state of a metal is due to a protective coating, whether of gas or of oxide, is not in accordance with electrochemical theory, which does, however, support Schöubin's view that passivity is caused by an alteration or "state of molecular stress" in the surface of the metal itself. Where a metallic anode dissolves, no oxidising action occurs at the anode; this phenomenon takes place only where the metal is passive, or where it dissolves as a polyvalent ion which, in solution, is converted into one of lower valency. Passivity, then, according

to the author's view, occurs in cases where the metal can form polyvalent ions, but where the potential difference requisite to cause these to enter into solution is so great that before it is reached the positive electrons themselves are torn away and enter the electrolyte, causing evolution of oxygen or oxidising actions at the anode. This represents the passivity of the noble metals, and of chromium, an element of stable passivity, which on dissolving as an anode, does so as hexavalent ions, at once decomposing water to form chromic acid and hydrogen ions. Lead under similar circumstances forms tetravalent ions, which in strong sulphuric acid dissolve to form $Pb^{IV}(SO_4)_2$, but in more dilute acid form lead dioxide, the corresponding plumbic acid being too weak to exist in the solution. The conversion of the passive into the active metal will clearly be favoured by the impact of anions on the passive anode, especially those which when discharged form substances of great activity from a purely chemical standpoint, such as chlorine and bromine; thus in hydrochloric acid, lead and iron readily lose their passivity, whilst the more stable passive chromium retains it. The recent discovery of Ruer that platinum can be dissolved or rendered active by an alternating current, especially if a continuous current be superposed, is entirely in accord with the present theory. In the case of iron, the passive ions are no doubt hexavalent, like those of chromium, as the passive iron behaves like a noble metal, and does not perceptibly dissolve, save where it has the opportunity (with strong alkali hydroxide electrolyte) of combining with hydroxyl ions to form ferric acid.—J. T. D.

Pig Iron and its Constituent Elements. H. L. Williams. Amer. Foundrymen's Assoc., June 1904.

THE author discusses the effect of carbon, silicon, sulphur, phosphorus, and manganese upon the physical properties of pig iron and castings. The effect of silicon depends upon the amount of carbon present and the rate of cooling. Increase of silicon tends to soften iron containing a high proportion of combined carbon; more silicon is required in light castings than in heavy ones. Manganese increases the affinity of iron for carbon, and also reduces the proportion of sulphur. Heavy castings should contain 0.80 per cent., but light castings not more than 0.50 per cent. In chilling work, up to 3 per cent. of manganese may be used. Ordinary foundry castings should contain up to 0.50 per cent. of phosphorus, and ornamental work up to 1.25 per cent. Silicon should be added to iron containing an excessive amount of phosphorus. The amount of sulphur in iron should be low, not exceeding 0.09 per cent. in ordinary castings.—A. S.

Sulphur in Pig Iron; Irregular Distribution of —. J. J. Porter. Amer. Foundrymen's Assoc., June 1904.

IN the following table are shown the results of the determination of sulphur in pigs from a number of different foundry irons containing from 1.50 to 4.00 per cent. of silicon, about 1.50 of manganese, 0.40 of phosphorus, and about 4.00 per cent. of total carbon. The samples for analysis were taken at different depths, and the figures show the great importance of the method of sampling, and also that the point at which the percentage of sulphur is highest is not always at the top of the pig, as is generally supposed.

	Percentage of Sulphur.				
	Pig A.	Pig B.	Pig C.	Pig D.	Pig E.
Hole No. 1—Top	0.115	0.088	0.068	0.165	0.116
" 2.....	0.125	0.068	0.061	..	..
" 3.....	..	0.052	0.061	..	..
" 4.....	..	..	0.084	..	..
" 5.....	..	..	0.059	..	..
" 6—Bottom	0.040	0.030	0.029	0.175	0.101

The author also observed slight variations in the percentage of sulphur lengthwise of the pigs.—A. S.

Scrap Iron. W. G. Scott. Amer. Foundrymen's Assoc., June 1904.

The author classifies scrap iron as follows:—Light machinery scrap (gray iron); heavy machinery scrap

(gray iron); stove plate scrap (gray iron); car wheel and chilled iron (gray iron); cast borings; malleable iron scrap; steel scrap; wrought iron scrap; and mixed scrap; and gives general average analyses of the different kinds.

	Silicon.	Sulphur.	Phosphorus.	Manganese.	Carbon.	Graphite.
Light machinery scrap.....	2.00—2.60	0.075—0.093	0.7 —0.9	0.2 —0.6	3.00—4.25	..
Heavy machinery scrap.....	1.6 —2.2	0.075—0.150	0.4 —0.8	0.3 —0.9	2.75—4.00	..
Stove plate scrap.....	2.3 —3.3	0.075—0.135	0.45 —1.25	0.2 —0.7	3.5 —4.5	..
Car wheel and chilled iron scrap.....	0.50—1.75	0.075—0.150	0.30 —0.65	0.3 —0.9	2.00—3.75	..
Borings:—						
Cast iron.....	1.5 —3.0	0.075—0.163	0.30 —1.25	0.2 —0.9	2.5 —4.5	..
Steel.....	0.0 —0.5	0.015—0.095	0.015—0.180	0.1 —1.0	*0.1 —1.5	..
Wrought iron.....	0.00—0.15	0.008—0.046	0.011—0.35	0.00—0.15	0.00—0.10	..
Malleable iron scrap.....	0.30—1.75	0.035—0.095	0.011—0.22	0.15—0.50	1.85—4.25	..
Steel scrap:—						
Ball.....	0.04—0.50	0.025—0.125	0.04 —0.14	0.18—1.50	*0.20—0.80	..
Castings.....	0.02—0.50	0.012—0.065	0.03 —0.12	0.20—0.80	0.15—0.90	..
Mixed.....	0.00—0.75	0.005—0.125	0.005—0.25	0.10—1.50	0.10—1.50	..
Wrought iron scrap.....	0.00—0.15	0.008—0.045	0.011—0.350	0.00—0.10	0.00—0.10	0.00—0.05

* Combined carbon.

—A. S.

Steel; Heat Treatment of — W. C. Roberts-Anstey and W. Gowland. Engineering, 1904, 77, 118—122, 138—142, 170—176, 184—189, 202—203, 205—208, 239—243, 289—292; Science Abstracts, 1904, 7, B, 476—477.

SPECIMENS of commercial rolled round bars of steels containing 0.130, 0.180, 0.254, 0.468, 0.722, 0.871, 0.947, and 1.306 per cent. of carbon, respectively, were tested, after being subjected to the following heat treatments:—(a) Annealing for $\frac{1}{2}$ hour at 620°, 720°, 800°, 900°, and 1100° C.; (b) soaking for 12 hours at 620°, 720°, 800°, 900°, and 1200° C.; (c) quenching in water at 720°, 800°, 900°, and 1200° C.; (d) quenching in oil at 720° C.; (e) quenching in oil at 720°, 870°, and 1000° C., and reheating to 350° C.; and (f) quenching in oil at 800° and 900° C., and reheating to 600° C. The tensile test pieces were $\frac{1}{2}$ in. and $\frac{1}{8}$ in. diameter, elongation being taken over 2 in.; the "elastic limit" was deduced from autographic stress-strain diagrams. The results are given in a series of tables and of curve-diagrams showing the change of breaking-stress, "elastic limit," elongation, and contraction, with the percentage of carbon. Stress-strain diagrams are given for the annealed specimens and for those quenched in water. After annealing at 620° C., the 0.871 per cent. carbon steel showed a lower "elastic limit" than either the 0.722 or 0.947 per cent. specimens, although it gave the greatest breaking-stress both in this condition and as rolled. In the 0.947 and 1.306 per cent. carbon steels, the breaking-stress was diminished by annealing at 800° C. and to a less extent at 900° C., owing to segregation of cementite. All the high-carbon steels were more or less "burnt" when subjected to annealing and soaking at and above 900° C., probably owing to decomposition of cementite into ferrite and amorphous carbon. The heating-curve of a sample of cementite prepared by Abel's method, showed that two changes occurred at about 1100° C.; the residue, after the heating, contained free carbon. The following conclusions are drawn from the stress-strain diagrams. The amount and regularity of elongation at the yield-point are dependent upon (1) the non-homogeneity of the steel; it is always greater when the steel is made up of two constituents, such as ferrite and pearlite, or pearlite and cementite, than when it contains only a single constituent; (2) the annealing of the bar at a temperature below A_r ; (3) the amount of ferrite present. Secondly, the amount of elongation which immediately precedes fracture varies with the homogeneous or non-homogeneous character of the steel, as in the first case. With similar thermal treatment, the steels containing most ferrite show greatest elongation. Annealing at 620° C. generally causes an increase of the elongation. The elongation is usually nil when the bar is composed of martensite, and always when "burning" has occurred.

—A. S.

Cementation of Carbon Steels and of Special Steels. L. Guillet. Comptes rend., 1904, 138, 1600—1602.

The potassium carbonate contained in wood charcoal is a factor in cementation effected by this substance; and the

diminution in the speed of cementation observed after some time is due to the exhaustion of the potassium carbonate by volatilisation. Barium carbonate has a similar influence to potassium carbonate, but does not volatilise, and the cementing power of a mixture of charcoal and barium carbonate remains constant. It is a matter of indifference whether air or nitrogen fills the cementation box. The speed of cementation, with a given mixture, depends on the composition of the steel. Manganese, chromium, tungsten, and molybdenum (elements which can substitute a portion of the iron in cementite) accelerate the action, as compared with that in the case of a carbon steel; while nickel, titanium, silicon, aluminium, and tin (elements which exist dissolved in the iron) retard it. The surface of bars of steel which had been treated in the cementation box was analysed immediately after cementation, and after intervals of six and 12 months; the carbon contents were respectively, 1.35, 1.05, and 0.85 per cent. Thus γ -iron dissolves carbon even at the ordinary temperature; and no doubt after a sufficient interval of time these bars would have become homogeneous throughout. (See also this J., 1903, 798.)—J. T. D.

Aluminium; Alloys of — with Magnesium and with Antimony. H. Pécheux. Comptes rend., 1904, 138, 1606—1607.

Aluminium-Magnesium.—While the author, operating by fusion in a crucible in presence of air (this J., 1904, 716), could not obtain stable alloys containing less than 65 per cent. of aluminium, Boudouard had formerly obtained not only $MgAl_3$ (81 per cent.) and $MgAl_2$ (70 per cent.), but also $MgAl$ (54 per cent. of aluminium). The last two, however, were obtained by operating in sealed tubes from which air was excluded.

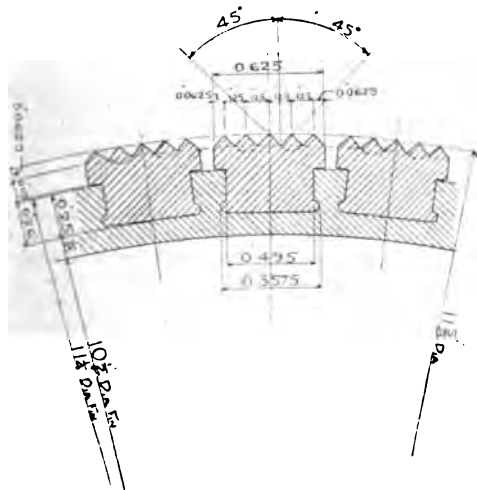
Aluminium-Antimony.—Aubel has obtained the alloy $SbAl$, melting at 1080° C.; Guillet the alloys $SbAl$, $SbAl_2$, and $SbAl_3$, which all ultimately fall to powder; and Gautier has studied the curve of melting-points, without obtaining definite alloys. The author has now obtained four definite alloys, $SbAl_{100}$, $SbAl_{75}$, $SbAl_{50}$, and $SbAl_{25}$, all melting between 750° and 760° C., and having, respectively, at 23° C., the densities 2.736, 2.700, 2.662, and 2.598. They all expand on solidifying. They are not brittle, though they file badly, have a coarse-grained vesicular fracture, do not oxidise at the temperature of casting, do not decompose water in the cold, even after filing ($SbAl_{25}$ decomposes it at 100° C.), but are attacked by mineral acids and by strong solution of potassium hydroxide.—J. T. D.

Zinc Ore; Magnetic Concentration of — in Virginia. C. Q. Payne. Eng. and Mining J., 1904, 77, 1001—1003.

The material consists of limonite iron ore in conjunction with hydrated silicate of zinc (calamine) and carbonate of zinc (smithsonite). The ground ore is mixed with 8—10 per cent. of coal slack and roasted in a cylindrical rotating reverberatory furnace. After cooling, the roasted material is passed over a double cylinder magnetic-separator. The

cylinders are seamless drawn steel tubes, 16 ins. diameter, and about $\frac{1}{8}$ in. thick, each containing a bipolar electro-magnet, the curved face of each pole, 10 ins. wide, being placed close to the wall of the cylinder, along which it occupies a certain arc. The upper cylinder is run at a speed of 200 revolutions per minute, and produces a clean concentrate containing about 48 per cent. of iron. The material not attracted by the top cylinder passes on to the lower one, where it is separated into clean zinc ore, and a certain amount of iron "middlings," which are passed through the separator again.

For the separation of limonite and calamine without previous roasting, a machine is used the design of which is based on the author's discovery that in the separation of feebly magnetic minerals, such as limonite, garnet, &c., a very powerful or dense magnetic field is less effective than one in which the position of the lines of force are so controlled that great differences of magnetic density are established therein.



The separating cylinders (see figure) of the machine are made of non-magnetic material having a high electrical resistance, and are provided, on their surface, with a series of grooves, in which are fitted thin, soft steel plates having toothed edges. When the cylinder is made to revolve in a magnetic field, the construction of its surface largely suppresses Foucault currents, which would cause resistance to its motion, whilst the toothed edges of the plates cause the lines of force to be so divergent that the particles of limonite can be attracted and held whilst in the field. The ore, after being very finely ground, is made to pass through two successive magnetic fields, arranged vertically. The upper field is formed in an air-gap between two stationary electro-magnets, each of which is placed inside a cylinder, the top one being the separating cylinder, and the lower one, of brass, the feed-cylinder. From the latter, the magnetic particles, when brought into the field, are attracted by the separating cylinder, and are conveyed over a division plate. The lower field is somewhat more powerful than the upper one, and allows of the separation of very feebly magnetic ore particles or "middlings." It is established in an air-gap between two opposing pole-pieces, one of which is connected with an external electro-magnet, and the other with one contained within the separating cylinder. The material is fed directly upon the upper part of the separating cylinder, and, by means of a non-magnetic guide-plate connected with the outer pole-piece, is conveyed into the field, which is situated just below the horizontal diameter of the cylinder.—A. S.

Molybdenum in Steel and Steel-making Alloys; Determination of — F. Van Dyke Cruser and E. H. Miller. XXIII., page 762.

Calclines; Analysis of — J. P. Walker. XXIII., page 761.

Gold-Mining: Application of Modern Theories of the Flow of Water. H. S. Hele-Shaw. J. Chem. Met. and Min. Soc. of S. Africa, May 1904, 420—426.

By means of ingenious experiments the author sets forth "a great and fundamental truth, viz., that not only does water flow with turbulent motion, which we can expect in a viscous liquid, but" under certain conditions "it can be made to flow with the stream-line motion of a perfect and frictionless liquid." He also shows "that in all the operations of gold-mining, it flows with both these movements, the former in the general mass of liquid, the latter on the surface or skin containing vessel or channel."—J. H. C.

Cyanide Solutions; Determination of Working Constants in — G. W. Williams. J. Chem. Met. and Min. Soc. of S. Africa, May 1904. Part II., 412—419. (For Part I. see this J., 1904, 683.)

METHODS for determining free cyanides, "protective alkali," carbonates, lime, sulphocyanides, gold, silver, zinc, cyanates, and sulphides are discussed, results of many experiments are detailed, and some improvements are suggested on methods previously described.—J. H. C.

ENGLISH PATENTS.

Crucible Furnaces. M. Harvey, Walsall. Eng. Pat. 23,909, Nov. 4, 1903.

A portable furnace containing a crucible is fixed in an outer casing which forms a blast chamber, so that the contents can be poured without removing the crucible. The outer casing is provided with trunnions and is mounted on a carriage. Means are provided for leading the blast into the furnace, for charging the fuel, for tilting the whole, and a spout for pouring.—W. H. C.

Heavy Metals; Process for the Extraction of — by Means of Chlorine. J. Savelsberg, G. Wannschoff, and Allgem. Elektro-Metallurgische Ges., Papenburg-on-the-Ems, Germany. Eng. Pat. 18,768, Aug. 31, 1903.

SEE U.S. Pat. 741,840 of 1903; this J., 1903, 1247.—T. F. B.

UNITED STATES PATENTS.

Ores; Classification of Metallic Constituents of — A. E. Cattermole, London. U.S. Pat. 763,259, June 21, 1904.

SEE Eng. Pat. 18,569 of 1903; this J., 1904, 256.—T. F. B.

Metallic Constituents of Ores from Gangue; Separation of the — A. E. Cattermole, London. U.S. Pat. 763,260, June 21, 1904.

SEE Eng. Pat. 18,589 of 1903; this J., 1904, 256.—T. F. B.

Separation of Minerals; Process of Effecting the — G. A. Goyder and E. Ioughton, Adelaide, S. Australia. U.S. Pat. 763,749, June 28, 1904.

SEE Eng. Pat. 16,839 of 1903; this J., 1903, 1133.—T. F. B.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(A.)—ELECTRO-CHEMISTRY.

Nickel from Zinc; Electrolytic Separation of — Hollard and Bertiaux. XXIII., page 762.

ENGLISH PATENTS.

Gaseous Medium from Air; [Electrical] Method of Generating a — J. N. Alsop, Owensboro. Ky., U.S.A. Eng. Pat. 10,538, May 7, 1904. Under Internat. Conv., May 29, 1903.

SEE U.S. Pats. 758,883 and 758,884 of 1904; this J., 1904, 611.—T. F. B.

Separation of Different Liquids from each other, as also for Separating Liquids from Bodies Suspended or Dissolved therein; Process [Electrical Endosmose] and Apparatus for the —. C. D. Abel, London. From Siemens and Halske, Akt.-Ges., Berlin. Eng. Pat. 14,195, June 25, 1903.

SEE Fr. Pat. 333,348 of 1903; this J., 1903, 1855.—T. F. B.

Sulphate of a Higher Oxide of Manganese; [Electrolytic] Manufacture of a —. J. Y. Johnson. From Badische Anilin und Soda Fabrik. Eng. Pat. 17,981, Aug. 19, 1903. VII., page 749.

Hydroxides and Oxides of Metals; Process for the Production of — by Electrolysis. F. F. Hunt, New York. Eng. Pat. 28,400, Dec. 24, 1903.

SEE U.S. Pat. 748,609 of 1904; this J., 1904, 119.—T. F. B.

Lead; Manufacture of Spongy or Porous —, and of Articles [Electrodes] therefrom. J. H. Mercadier, Louvres, France. Eng. Pat. 7981, April 6, 1904. Under Internat. Conv., April 7, 1903.

SEE Fr. Pat. 331,006 of 1903; this J., 1903, 1092.—T. F. B.

UNITED STATES PATENTS.

Electrically Extracting Essential Oil; Process and Apparatus for —. G. D. Burton, Boston, Mass., Assignor to Boston Leather Process Co., Portland, Me. U.S. Pats. 763,151-2, June 21, 1904.

THE essential oil is extracted and distilled off by immersing bark, or other vegetable matter in a suitable menstruum through which an electric current is passed to raise the temperature to the desired extent. The apparatus is in the form of a closed still provided with connections for the electric current and with a condenser. The material to be treated, is contained in porous bags and is surrounded by the extracting solution which serves also to conduct the current.—R. S. H.

Treating Sewage; [Electrolytic] Apparatus for —. W. J. Schweitzer. U.S. Pat. 763,026, June 21, 1904. XVIII. B., page 758.

(B).—ELECTRO-METALLURGY.

Electro-Plating; Composition of Baths for —. R. Namias. Monit. Scient., 1904, 18, 487—488.

THE following baths are recommended:—

Nickel.—Forty grms. of crystallised nickel sulphate, 25 grms. of ammonium chloride, 10 grms. of boric acid, and 10 grms. of citric acid per litre.

Silver.—The cyanide bath is made up to the formula AgCN , 2KCN . As it becomes alkaline in use, a little potassium cyanide and mono-potassium citrate are added from time to time.

Copper.—Solution A:—30 grms. of normal copper acetate, 30 grms. of sodium sulphite, 5 grms. of ammonium carbonate, and 500 c.c. of water. Solution B:—35 grms. of potassium cyanide and 500 c.c. of water. A and B are mixed warm.

Brass.—Fifty grms. of copper acetate, 25 grms. of zinc chloride, 250 grms. of sodium sulphite, 35 grms. of ammonium carbonate, and 100 grms. of potassium cyanide in 3 litres.

Gold.—To gold chloride solution ammonia is added, the precipitate is dissolved in 1 per cent. potassium cyanide, and the solution boiled. One grm. of gold per litre is the minimum.

Platinum.—A solution of potassium chloroplatinate, containing not less than 2 per cent. of the salt.

Iron.—Forty grms. of ferrous sulphate, 100 grms. of ammonium chloride, 100 grms. of ammonium citrate, and 1 litre of water. The citrate prevents anodic deposition of basic salt.—W. A. C.

Steel; "Ageing" of Sheet —. T. S. Allen. Electr. World and Engineer, 1903, 41, 1048—1049. Science Abstracts, 1904, 7, B, 469.

THE results of the author's tests on commercial sheet steel for armature construction are given in a series of curves. It was found that "ageing" takes place in all sheet steel subject to a varying temperature, and especially in steels having a high initial hysteresis. Most of the samples with high initial hysteresis examined, "aged" at first, but after periods varying from 20 to 160 days, at a mean temperature of 93°C ., the hysteresis showed a tendency to come down to near the initial value. The author concludes from the results of the tests that annealing is useless for armature iron.—A. S.

Nickel Cathodes. D. H. Browne. Electrochem. Ind., 1903, 1, 348—349. Science Abstracts, 1894, 7, B, 461—462.

THE tendency of electrolytically deposited nickel to crack and curl off the cathode in a shape resembling shavings of wood, is attributed to local irregularities in the electrolyte. Artificial circulation of the electrolyte, the employment of a uniform current-density throughout the electrolysis, and the use of a graphitised cathode of rolled block tin are recommended. Good results, so far as the flexibility of the deposited nickel is concerned, were obtained under the following conditions:—Electrolyte, 70 grms. of nickel chloride and 180 grms. of sodium chloride per litre; temperature, 70°C .; current density, 100—200 amperes per sq. m. With regard to the curvature of the deposit, it was observed that the curling was always in the direction of the anode, and around the longer axis of the cathode. By the use of a cathode plate of reversed curvature, it is stated that the deposit when stripped from the backing, "sprang into a perfect plane surface."—A. S.

Metal Extraction; Electric — from Ores by Means of Insoluble Electrodes. S. Laszczynski. Elektrochem. Zeits., 1904, 11, 54; Chem.-Zeit., 1904, 28, Rep. 191.

IN cases in which the anodic oxidation of a cation is to be prevented, the author surrounds the insoluble cathode with a closely-fitting layer of porous material or fabric.

—T. H. P.

Molybdenum; New Carbides of —. H. Moissan and K. Hoffmann. Comptes rend., 1904, 138, 1558—1561.

CAST molybdenum, carbon, and excess of metallic aluminium, are heated together in the electric furnace; the reaction must not be carried on too long, or the temperature (which is kept down by the volatilisation of the aluminium) will rise too high. The fusion is treated successively with solution of potassium hydroxide, dilute sulphuric acid, and concentrated hydrochloric acid, and the graphite separated mechanically. There remains a molybdenum carbide of formula MoC ; very hard, not decomposing water in the cold, or steam at 600°C . It seems analogous to Williams' tungsten carbide. Possibly it plays a part in the formation and behaviour of tungsten steels.—J. T. D.

ENGLISH PATENT.

Electro-Deposition of Metals on Aluminium, Alloys of Aluminium, and other Metals. F. W. Croucher, Fleet, Hants. Eng. Pat. 13,182, June 12, 1903.

IN order to ensure the adhesion of the deposited metal the aluminium is prepared by treatment with a large number of special solutions intended to clean its surface, viz., whale oil soap, hydrochloric acid, potassium cyanide, phosphoric acid, sulphuric and nitric acids, potassium cyanide, ammonium cyanide, ammonium chloride, and cyanide or bichloride of mercury, and caustic potash; it is then passed through suitable "striking" baths before being placed in the depositing vat.—R. S. H.

UNITED STATES PATENT.

Aluminium; Process of Electrolytic Manufacture of —. G. Gin, Paris. U.S. Pat. 763,479, June 24, 1904.

SEE Eng. Pat. 964 of 1903; this J., 1903, 805.—T. F. B.

XII.—FATTY OILS, FATS, WAXES, AND SOAP.

Lard; Crystals obtained in the Belfield Test for —.
H. Kreis and A. Hafner. Z. Untersuch. Nabr.-u. Genussm., 1904, 7, 641—669.

The difference between the form of the crystals deposited from an ethereal solution of lard and from a solution of beef fat was attributed by Hehner and Mitchell (Analyst, 21, 328) to the presence of a greater proportion of stearic acid in the beef crystals. The authors, however, have not been able to confirm the observations of Hehner and Mitchell as to the gradual formation of needle-shaped crystals from lard on recrystallisation, but invariably obtained the chisel-shaped crystals. Their lard crystals melted at 45° to 47° C., then solidified as the temperature rose, again becoming liquid at 61° C. The crystals from beef fat melted at 43° and 58.5° C. After repeated crystallisation from ether the melting points of the crystals became constant, at the temperatures recorded for the mixed glycerides described in the author's former paper (this J., 1903, 1136). The synthetical glycerides prepared as described before, were identical in every respect with these natural glycerides, and the authors therefore conclude that their explanation of the difference between lard and mutton or beef fat crystals in the Belfield test is that the latter consist of (impure) palmito-distearin, and the former of heptadecylo-distearin. Pure heptadecylic acid, $C_{17}H_{34}O_2$, from the lard crystals melted at 55.5° C. It was more soluble in 95 per cent. alcohol than either stearic or palmitic acid, 100 c.c. dissolving 0.970 to 0.972 grm. at 0° C.—C. A. M.

Oils; Decolorisation of — with Aluminium Magnesium Hydroxide [Florida Fullers' Earth]. Hirzel. Chem. Rev. Fett- u. Harz-Ind., 1904, 11, 116—118, 145—146.

FULLERS' earth is found in alluvial deposits of $\frac{1}{2}$ to 4 metres in thickness in the interior of Florida. It usually occurs above a layer of sand, and beneath a layer of $\frac{1}{2}$ metre of humus and $\frac{1}{2}$ to 2 metres of plastic clay. When freshly dug out it is a moist greenish mass, which has to be freed from clay and sand, and dried in thin layers before it can be sold. During the drying process it loses about 50 per cent. in weight, and leaves a white friable mass which still contains from 15 to 18 per cent. of water. Finally it is ground in a mill and sorted into different grades by sifting. The commercial product is a neutral white or greyish or yellowish white powder, which when dry is extremely hygroscopic. Its average composition is as follows:—Silica, 55.53; alumina, 11.57; magnesia, 6.29; iron oxide, 3.32; calcium oxide, 3.06; water, 17.95; and alkalis, &c., 1.28 per cent. It is usually necessary to dehydrate Florida fullers' earth before use. This is best done in a special apparatus from which air is excluded as far as possible, the powder being heated with continual agitation at 300° to 500° C., until it assumes a greyish-blue shade. This removes both the absorbed water and the chemically combined water of hydration. For many purposes it is sufficient to expel absorbed water by heating the powder at 120° C., though the product is a much less effective bleaching agent than that roasted at the higher temperature. Preliminary experiments should be made with the oils or fats to be bleached, in order to determine the most suitable temperature in each case. Thus, light mineral oils, such as lamp petroleum and vaseline oil, are completely decolorised at 12°—17° C., whilst 60° to 80° C. is the most suitable temperature for finer vegetable oils, and 70° to 125° C. for solid fats. In the case of the heaviest mineral oils, such as cylinder oil, bleaching can only be effected at higher temperatures (140°—150° C.). The amount of earth required also varies with the different oils, some requiring 3 to 5 per cent., others 7 to 10 per cent., whilst others again need as much as 15 to 20 per cent., or more. Hard paraffin, after preliminary treatment with sulphuric acid &c., is completely bleached by means of only $\frac{1}{2}$ to 2 per cent. of the earth. Cocoa nut oil, palm kernel oil, mustard seed oil, and olive oil require 2 to 3 per cent.,

whilst rape oil, arachis oil, cottonseed oil, and linseed oil need a greater proportion—usually 5 to 10 per cent. The earthy flavour left in edible oils after treatment with the fullers' earth can be removed by a short treatment with 10 per cent. of a 10 per cent. solution of sodium chloride, or with 1 to $\frac{1}{2}$ per cent. of powdered dry sodium bicarbonate. The method of treatment has also great influence on the results. The filtration method is simple and widely employed, but is open to the objections that filtration through a layer of 430 mm. is slow, that only the coarser grades of earth can be used, and that some method of heating the oil or fat during the filtration is necessary. In methods by mixing, the oil, brought to the right temperature, is mechanically mixed for about 20 minutes with the requisite proportion of earth, and then pressed in a filter press. The earth left in either process contains about 80 per cent. of its weight of oil. In the case of linseed or other drying oils the powder can be used in oil paints, whilst in the case of other oils the earth can be extracted with a suitable solvent. The oil thus obtained is of a dark colour, but can be bleached by means of more Florida earth. The residual earth can be regenerated by heating it to 400°—500° C., and the dark grey to black product thus obtained can be used again for bleaching purposes, preferably after the addition of 15 to 20 per cent. of fresh earth.—C. A. M.

Fats; Decomposition of Potassium Iodide by —.
A. Heffter. XX., page 758.

Grease Oleines [Wool Oils]; Detection of Mineral Oil in Distilled —. A. H. Gill and S. N. Mason. XXIII., page 768.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(A.)—PIGMENTS, PAINTS.

UNITED STATES PATENT.

Iron, Preparation of Silts of — for Use in Oil Colours.
E. Vidal, Paris. U.S. Pat. 763,574, June 28, 1904.
SEE Fr. Pat. 333,865 of 1903; this J., 1903, 1344.—T. F. B.

(C.)—INDIA-RUBBER, &c.

Kickxia Rubber. M. Zitzow. Gummi-Zeit., 1904, 18, 793—794.

Of the seven varieties of kickxia rubber at present known only the *K. elastica* Preusz yields a useful latex, and it is also the most widely distributed. On account of its great productive capacity and easy culture, this tree should be selected as the most suitable for West Africa, especially as it would serve a good purpose in shielding cocoa-plantations from sun and wind.—J. K. B.

Crude Rubber; Examination of —. G. Fendler. XXIII., page 764.

India Rubber; Weber's Method for the Direct Determination of —. P. Alexander. XXIII., page 765.

Sulphur in Golden Antimony Sulphide used for Rubber Manufacture. W. Esch and F. Balla. XXIII., page 761.

XIV.—TANNING; LEATHER, GLUE, SIZE.

Tannin; Determination of — without Hide Powder.
H. Wislizenus. XXIII., page 765.

ENGLISH PATENT.

Gelatine and Glue; Detanning Mineral Tanned Leather, or Leather Waste, or the like for the Manufacture of —. A. R. Weiss, Hilchenbach, Germany. Eng. Pat. 21,879, Oct. 5, 1903.

SEE U.S. Pat. 738,709 of 1903; this J., 1903, 1096.—T. F. B.

UNITED STATES PATENT

Bating or Puering Skins; Process for —. O. P. Amend, New York. U.S. Pat. 763,347, June 28, 1904.

HIDES or skins are treated with a solution of an ammoniacal salt, small quantities of an acid such as hydrochloric acid being added at intervals so as to re-form the salts.

—R. L. J.

XV.—MANURES, Etc.

Sodium Nitrate on the Constitution of the Soil; Effect of the long-continued Use of —. A. D. Hall. Chem. Soc. Proc., 1904, 20, 154.

AFTER a review of the results of the mechanical analysis of Rothamsted soils, it was observed that those which had been manured with sodium nitrate every year, gave abnormal results; a further series of fifteen soils was examined drawn from each of the Rothamsted fields where plots with and without sodium nitrate occurred. In general, the use of sodium nitrate has resulted in a lower proportion of "klay" being left in the surface soil. This result was most manifest in the mangel field, where cultivation is frequent, and was not apparent at all in the grass field, where the turf protects the soil from the washing action of the rain. The removal of the finest particles from the surface soil is attributed to deflocculation induced by the use of sodium nitrate and followed by the washing of the finest particles into the subsoil. This hypothesis is confirmed by chemical analysis of the "klays" separated in the mechanical analysis of some of the subsoils, which were found to be richer in fine particles beneath the soils receiving nitrate, and by the condition of the same soils in the field, which showed every evidence of deflocculation.

Soil Acidity; Comparison of Methods for the Determination of —. F. P. Veitch. XXIII., page 762.

XVI.—SUGAR, STARCH, GUM, Etc.

Diffusion Juice; Cold and Hot Liming of —. Prangey and de Grobert. Bull. Assoc. Chim. Sucr. et Dist., 1904, 21, 1241—1247.

AN examination of the properties of the principal constituents of the non-sugar portion of beetroot juice, leads to the conclusion that the raw juice should not be heated before carbonating, as, in presence of large additions of lime, there is danger of causing the melassigenic substances which have been rendered insoluble in the scums to re-enter into solution. The only objection to heating the unlimed juice is that the slight acidity (due chiefly to asparagine) may cause inversion, but this may be easily overcome by the addition of a very small quantity of lime to neutralise the acidity. When normal beetroots, which have been gathered only a short time, are being worked, erroneous procedure does not cause serious trouble, but it is quite otherwise if the roots have undergone alteration during storage.—I. J. de W.

Reducing Sugars; Potassium Bromide as Indicator in the Determination of — with Fehling Solution. P. Berti. XXIII., page 765.

FRENCH PATENT.

Sugar; Extraction of — from the Beet and other Plants in one Operation and without producing Molasses. E. Lallemand. Fr. Pat. 339,763, Jan. 21, 1904.

In this process the dried beet or other material, preferably in a coarsely powdered condition, is treated in an extraction apparatus with alcohol of suitable strength, and at as high a temperature as possible without boiling the alcohol. When the latter is sufficiently saturated with sugar, it is removed from the residue and cooled to a low temperature to separate the sugar. The alcohol is then again used for

extracting the residual matter, after which it is cooled down as before. This process is repeated until all the sugar is removed from the material. The sugar thus obtained, either in crystals or as a syrup, is then refined.—T. H. P.

XVII.—BREWING, WINES, SPIRITS, Etc.

Beer; Condition, Viscosity, and "Head" Retention in —. O. Mohr. Woch. f. Brau., 1904, 21, 368—368.

REFERRING to Prior's hypothesis that the retention of carbon dioxide in beer is partly attributable to combination with primary phosphates, the author points out that the mean content of phosphoric acid in beer is only 0.07 per cent. so that not more than 0.03 per cent. of carbon dioxide can enter into such a combination. Equally untenable in his opinion are the assumptions, based on no experimental evidence whatever, of the formation of an ester by the union of the carbon dioxide and the alcohol present. The formation of carbonic acid (H_2CO_3) in aqueous solution has long been recognised. The combination of carbon dioxide with the proteids of beer, as suggested by Hanke, is equally unsupported by experimental evidence, the gas being merely held in suspension to an extent determined by the viscosity of the liquid. In examining the influence of the various constituents of beer on the viscosity, he uses the Ostwald viscosimeter, and finds that, with water = 100, one per cent. of absolute alcohol = 104—105, whilst 10 per cent. = 156—157. The method is simpler than gravity determinations, and can be performed with about 5 c.c. of liquid. By the same method a 1.25 per cent. solution of dextrin gives the viscosity 109—110, and a 5 per cent. solution = 142—147.9. Maltose has a far smaller influence on the viscosity, that of a 1.25 per cent. solution being only 103, and a 5 per cent. solution = 112.5. Glycerol gives almost identical results as maltose, whilst the mineral salts have a still smaller influence, potassium chloride even reducing the viscosity below that of water alone (the 7.46 per cent. solution = 93.3). Finally, the influence of the proteids diminishes in proportion to the degree of degradation, casein (1 per cent. solution) giving 119.8, peptone 104.2, and asparagine 100.9. Ullik's assumption that the viscosity of beer is affected by (undetermined) substances present in very small amount, seems to be justified, since the calculations based on the viscosity of the alcohol and extract present (the latter being calculated as dextrin), give results below those of the actual determination of the beer. Nevertheless, the alcohol, and above all the extract, form the chief factors in governing the viscosity, and, therefore, to ensure head retention, it is important to aim at low attenuation, especially when working with worts of low initial gravity.—C. S.

Beer; Influencing the Retention of "Head" in —. A. Bau. Woch. f. Brau., 1904, 21, 382—383.

IN addition to the positive causes of "head" retention, i.e., viscous substances and infinitely minute colloid particles, there must be taken into account a negative factor, namely, the absence of substances tending to reduce the surface tension of the beer. Among these head-destroying substances, the chief place is occupied by amyl alcohol and secondary octyl alcohol formed during fermentation, the addition of a drop of which to beer with good "head" will cause the latter to dissipate immediately with brisk effervescence. Next come the corresponding aldehydes and acids, whereas, contrary to the usual opinion, fats have little influence. It is well known that acetic acid, lactic acid, succinic acid, and glycerol are among the by-products of fermentation in beer; but whether the various alcohols, aldehydes, and acids found in spirit and wines are also formed in beer has still to be determined.

—C. S.

Fermenting Liquids; Importance of Determining the Degree of Infection in — immediately after Sampling. P. Lindner. Woch. f. Brau., 1904, 21, 368—369.

In sending samples of wort or beer through the post for biological examination, the relative character of the organisms

may undergo alteration, and, therefore, cease to accurately represent the original conditions. On this account the author recommends brewers to make droplet cultures on hollowed object glasses, since this method will give precise indications in 15 to 20 hours, and will afford valuable information as to the keeping qualities of a batch of bottled beer, for example.—C. S.

Maltase Action; The Constancy of — and the Influence of the Products of Reaction. C. Philoche. *Comptes rend.*, 1904, 138, 1634—1636.

THE author brings forward fresh proofs of the constancy of the action of maltase, which retains its initial activity for 38 hours, in presence of the products of the transformation. The retardation produced in the action of maltase by the addition of dextrose is much less than that exerted by invert sugar on invertase.—T. H. P.

Beer; Notes on Claussen's Paper on Sarcina Sickness in —. H. Will and R. Braun. *Z. ges. Brauw.*, 1904, 27, 462—463. (See this J., 1904, 332.)

IN the authors' experience a 5 per cent. solution of ammonium fluoride suffices to thoroughly disinfect brewery utensils. For hose pipes the 0.5 per cent. solution recommended by Claussen for the detection of *pediococci* should be allowed to act for at least 12, and preferably for 24 hours. The antiseptic should not, however, be used too many times or too long, for though it will continue efficacious for three to four weeks, it afterwards allows *sarcinae* to develop. Contrary to Claussen's experience they have found that *sarcina* beer, after treatment for half an hour with an equal volume of a 1 per cent. solution of ammonium fluoride, was not freed from infection, development taking place in ammoniacal yeast water. Very weak potassium fluoride (0.003—0.007 per cent.) greatly favours the growth of *sarcina*, whilst retarding that of yeasts and rod bacteria. They cannot agree that ammoniacal yeast water is entirely unsuitable for the detection of *sarcina* in brewery practice, having often found it reliable for this purpose, though care is necessary in adding the ammonia.—C. S.

Wort and Beer Pipes; Causes and Prevention of Infection in —. G. Luff. *Z. ges. Brauw.*, 1904, 27, 453—456, 484—497.

THERE is practically no difference in efficiency between the various disinfectants used for cleansing metal- and hose-pipes, when diluted to the necessary working strength; consequently selection must depend on the cost, possibility of use over again, and action on the pipes, utensils, &c. Disinfectants containing hypochlorous acid cannot be used twice. Soda intended for use again must be kept in a metal vessel, whereas the hydrofluosilicic acid preparation "montanin" can be stored in wooden utensils. Four per cent. solutions of this efficient antiseptic have no action on the metallic fittings, varnish, or materials of brewing utensils or pipes. Since the action of disinfectants is in no case more than temporary, the pipes to be cleansed should be treated at least once a week (more often in summer) for two hours with a 4 per cent. solution of "montanin," or with some other preparation of suitable strength.—C. S.

Lecithin; Presence of — in Wine. A. Rosenstiehl. *Monit. Scient.*, 1904, 18, 485—487.

WEIRICH and Ortlieb (this J., 1904, 333) found 0.35 gm. of lecithin per litre in a Greek wine from Thera: about as much as is contained in milk. In criticising their conclusions, the author points out that the lecithin is derived rather from the juice than from the pulp, and that it is not appreciably destroyed by his process of heating the must before fermentation.—W. A. C.

Oxidising Ferment [Anaerobrydase]; Action of an Indirect — on Vanillin and Morphine. E. Bourquelot and L. Marchadier. XXIV., page 766.

Peroxydase Reaction; Velocity of the —, &c. A. Bach and R. Chodat. XXIV., page 766.

Oxido-reducing Enzyme; Existence and Conditions of an — in Plants. J. E. Abelous. XXIV., page 766.

ENGLISH PATENT.

Filtering Liquids [Wines, Beers, &c.]; Process and Apparatus for —. S. H. Johnson and S. H. Johnson and Co., Ltd., Stratford. Eng. Pat. 10,753, May 10, 1904.

A VERTICAL filter-press has the plates arranged around a central tie rod, and has a base plate attached to one end. In the latter are suitable openings for feeding and discharging the liquid. An air- and water-tight cover encloses the press, and is attached to the base plate. A strainer is provided to keep back larger particles of solid matter. The process applied to "fermented beverages and the like" is claimed as well as the apparatus.—W. H. C.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(A.)—FOODS.

Butter and Margarine; Browning and Frothing of — on Heating. G. Fendler. *Chem. Rev. Fett- u. Harz-Ind.*, 1904, 11, 122—124.

FROM the results of experiments (described in detail) the author concludes that the frothing of butter when heated is not due to the presence of soap. Margarine can be made to froth and become brown, like butter, by the addition of 0.2 per cent. of egg yolk or 0.2 per cent. of lecithin. The presence of traces of sugar, such as is introduced with the milk in milk margarine, is also a necessary factor for the browning.—C. A. M.

Cocoanut Oil in Butter; Determination of —. A. Müntz and H. Coudon. XXIII., page 764.

Lard; Crystals obtained in the Belfield Test for —. H. Kreis and A. Hafner. XII., page 755.

Borax [Mineral Spring Water]; Relation of — to Carbonic Acid. L. Grünhut. XX., page 758.

Alkali Fluorides in Foods; Detection of —. J. Froidevaux. XXIII., page 760.

FRENCH PATENTS.

Milk Powder; Process for Obtaining —. J. R. Hatmaker. Fr. Pat. 339,943, Jan. 27, 1904.

BEFORE evaporating, the acidity of the milk is reduced to "3 degrees" by the addition of a suitable alkali. A preliminary titration is made on a small quantity of the milk in order to ascertain the amount of alkali (e.g., sodium bicarbonate) to be added to the bulk thereof. "Degrees" of acidity is an expression referring to the number of c.c. of N/10 sodium hydroxide solution required per 100 grms. of milk.—W. P. S.

Milk and Lecithin Food Products; Preparation of —. A. Fournier. Fr. Pat. 340,047, Jan. 30, 1904.

THE claims are for mixtures of milk, cheese, butter, condensed milk or the like, and lecithin. The latter is added in the form of a concentrated alcoholic or ethereal solution. After thorough incorporation, the alcohol or ether is removed by evaporation, and the mixture sterilised. The lecithin solution and the milk may be separately sterilised before mixing.—W. P. S.

Milk; Process and Apparatus for Producing Purified —, and Cream and Butter freed from all Objectionable Germs. G. Daseking and H. Paradies. Fr. Pat. 340,145, Feb. 3, 1904.

SEE Eng. Pat. 12,045 of 1903; this J., 1904, 381.—T. F. B.

Coffee; Process of making an Extract of —. A. Farago and S. Bartba. Fr. Pat. 340,404, Feb. 12, 1904.

SEE Eng. Pat. 3465 of 1904; this J., 1904, 452.—T. F. B.

(B.)—SANITATION; WATER PURIFICATION.

Formaldehyde; Atmospheric —. H. Henriët. Comptes rend., 1904, 139, 67—68.

THE author's determination of the amount of formaldehyde in the air (this J., 1904, 687) from the amount of carbonic acid formed when the air was passed over heated mercuric oxide, led to the figures 2 to 6 grms. per 100 cubic meters of air. Air containing such a proportion, however, would be quite irrespirable; hence the carbon dioxide formed cannot have proceeded from free formaldehyde, but was possibly derived in part from some compound of formaldehyde. Water through which air has been passed in large quantity gives the reaction of formaldehyde; but if the same water be previously treated with sulphuric or acetic acid, formaldehyde is indicated in much larger amount, which shows that some compound of formaldehyde does exist in the air. Delépine has shown that formaldehyde heated with water yields formic acid, carbon dioxide, and methyl alcohol; and as the author has found formic acid and extra carbon dioxide in the atmosphere at times of fog, he suggests that Delépine's reaction may occur in the atmosphere, and that the methyl alcohol and formaldehyde may react to form methylal, from which formaldehyde can be regenerated by the action of acids.—J. T. D.

Formaldehyde; Presence of — in the Products of Combustion of Fuels. A. Trillat. II., page 744.

UNITED STATES PATENT.

Treating Sewage; [Electrolytic] Apparatus for —. W. J. Schweitzer, Whiteplains, N.Y. U.S. Pat. 768,026, June 21, 1904.

AN electrolysis chamber is used in conjunction with settling tanks for the treatment of sewage which is caused to flow through the system. The grease is subsequently removed, the sediment allowed to settle, and the purified water run off through a filter.—R. S. H.

(C.)—DISINFECTANTS.

UNITED STATES PATENT.

Insecticide Compounds. O. D. Goodell, Baltimore. U.S. Pat. 763,481, June 28, 1904.

THE following substances mixed together compose this insecticide:—Barium sulphide (the chief constituent), barium silicate, potassium silicate, potassium oxide, and barium oxide, together with iron sulphide, silicic acid, and carbon, if desired.—R. L. J.

XIX.—PAPER, PASTEBOARD, Etc.

UNITED STATES PATENT.

Viscose; Process of Purifying —. C. F. Cross, London, Assignor to D. C. Spruance, Philadelphia. U.S. Pat. 763,266, June 21, 1904.

SEE Eng. Pat. 21,030 of 1903; this J., 1903, 1363.—T. F. B.

FRENCH PATENT.

Celluloid; Artificial —. J. Schmerber. Fr. Pat. 340,266, Feb. 8, 1904.

METHYLACETANILIDE is claimed as a partial or complete substitute for camphor in the manufacture of celluloid. 40 parts of the two substances mixed or 30—35 parts of methylacetanilide only, dissolved in the usual proportion of alcohol are equal in effect to 50 parts of camphor per 100 of nitro-cellulose.—R. L. J.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Borax; Relation of — to Carbonic Acid [Mineral Spring Water]. L. Grünhut. Z. phys. Chem., 1904, 48, 569—576.

IN aqueous solution, borax dissociates completely into sodium metaborate and free boric acid. This view, first enunciated by Schweizer in 1850, is confirmed by the results of modern research, especially by Shelton's recent determinations of the change of electric conductivity of a solution of borax as sodium hydroxide is slowly added to it. If carbon dioxide be led into an aqueous solution of borax, however, the sodium metaborate is decomposed, a corresponding amount of free boric acid is formed, and the whole of the sodium is converted into bicarbonate. If, in presence of carbon dioxide, a large excess of boric acid be added, a certain, though very slight, formation of sodium metaborate occurs, as shown by the slight decrease in electric conductivity. From this it would seem that the small amount of boric acid which occurs in the waters of some mineral springs must exist, at least in the presence of free carbon dioxide, as free acid, H_2BO_3 .—J. T. D.

Basic Mercury Salts. A. J. Cox. Z. anorg. Chem., 1904, 40, 146—181.

THE authors have applied the phase rule to the examination of the hydrolysis of mercury salts and find that mercuric chromate, mercuric and mercurous nitrates, and mercuric and mercurous sulphates are converted first into basic salts and then into the oxide; mercuric fluoride is converted directly into the oxide.

Mercuric Chromate.—Only one basic salt exists, a dark red powder of the composition, $3HgO \cdot CrO_3$, and this is not stable when the acid-concentration of the solution is less than 0.00096 N at 50° C. The other so-called basic mercuric chromates are merely mixtures either of the normal and basic salts or of the basic salt and mercuric oxide. The normal chromate is stable only when the acid-concentration of the solution is as high as 1.41 N (at 50° C.).

Mercuric Nitrate.—One basic salt, a heavy white powder of the composition, $3HgO \cdot N_2O_5$, exists. The minimum acid-concentration at which the normal and basic salts respectively, are stable at 25° C. are 16.72 N and 0.159 N.

Mercuric Sulphate.—The basic salt has the composition, $3HgO \cdot SO_3$, and forms a heavy, bright lemon-yellow powder, much less soluble than the normal salt. The minimum acid-concentrations at which the compounds are stable at 25° C. are: normal salt, 6.67 N; basic salt, 0.0018 N.

Mercuric Fluoride.—This salt is converted directly into mercuric oxide by the action of water, no basic salt being formed. It is stable when the acid-concentration of the solution is 1.14 N at 25° C.

Mercurous Nitrate.—Two basic salts were isolated, one a white powder having the composition, $5Hg_2O \cdot 3N_2O_5 \cdot 2H_2O$, and the other a yellowish-green powder, probably $3Hg_2O \cdot N_2O_5 \cdot 2H_2O$. It is probable that other basic salts also exist. The minimum acid-concentrations at which the compounds are stable at 25° C. are: normal salt, 2.95 N; basic salt, $5Hg_2O \cdot 3N_2O_5 \cdot 2H_2O$, about 0.293 N; basic salt, $3Hg_2O \cdot N_2O_5 \cdot 2H_2O$, 0.0017 N.

Mercurous Sulphate.—Only one basic salt, $2Hg_2O \cdot SO_3$. H_2O exists, and this is stable when the acid-concentration of the solution is 0.00056 N at 25° C. The normal salt is stable when the acid-concentration is 0.0042 N at 25° C. —A. S.

Potassium Iodide; Decomposition of —, by Fats. A. Heffter. Schweiz. Woch. Chem. Pharm., 1904, 42, 320; Chem.-Zeit., 1904, 28, Rep. 188.

POTASSIUM iodide ointment, prepared with lard and water, becomes coloured sooner or later, small quantities of iodine being liberated. The substance causing this decomposition is found to be the hydrogen peroxide contained in the water made use of; the action is accelerated in presence

of traces of free fatty acids. The fats are said to be "auto-oxidisable substances," which take up oxygen from the air, yielding peroxide compounds, the latter then oxidising the water to hydrogen peroxide.—T. H. P.

Morphine Reaction; New —. C. Reichard. XXIII., page 763.

Nux Vomica; Extract of —. K. Papl. Apoth.-Zeit., 1904, 19, 325; Pharm. J., 1904, 73, 10.

EXPERIMENTS to determine the best conditions for the preparation of extract of nux vomica led to the following results, the most satisfactory extract being that obtained by percolating with dilute alcohol at between 20° and 30° C.

Extraction with 70 per cent. Alcohol.

Temperature.	Yield of Extract.	No. of c.c. of N/100 Acid required by Alkaloids in 0.06 grm. of Extract.
° C.	Per Cent.	
0	8.368	30.7
10	8.404	30.5
15	8.612	30.9
20	8.766	32.6
25	8.766	32.7
30	8.954	31.4
40	8.666	29.9
50	8.602	30.4
60	8.078	29.8

Extraction at 25°—30° C.

Strength of Alcohol.	Yield of Extract.	No. of c.c. of N/100 Acid required by Alkaloids in 1 grm. of Extract.
Per Cent.	Per Cent.	
40	9.358	38.6
50	9.286	44.4
60	9.048	47.5
70	8.964	46.7
80	8.162	42.3
90	6.308	35.6
99	5.474	

The extracts obtained with 40 and 50 per cent. alcohol were friable; in the others the proportion of fat increased with the strength of the alcohol used. Previous removal of the fat by means of petroleum spirit did not give satisfactory results, the yield and strength of the extract both being diminished.—A. S.

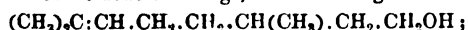
Vanillin and Morphine; Action of an indirect Oxidising Ferment [Anaerobase] on —. E. Bourquelot and L. Marchadier. XXIV., page 766.]

Vanilla containing Heliotropin. Göller. Pharm. Centralh., 1904, 192. Chew. and Druggist, 1904, 65, 13.

THE author finds that the vanillon or pompona (the fruit of *Vanilla pompona*), and the fruit of *V. planifolia* contain heliotropin as well as vanillin. These varieties of vanilla cannot be used as spices, but are employed to a considerable extent in perfumery.—A. S.

Rhodinol, the Characteristic Alcohol of Oil of Roses; Complete Synthesis of —. L. Bouveault and Gourmand. Comptes rend., 1904, 138, 1699—1701.

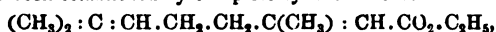
BOUVEAULT and Barbier (this J., 1896, 373) first identified rhodinol, and showed it to be characteristic of the oils of rose and of *Pelargonium odoratissimum*. Tiemann and Schmidt suggested that it was an optical isomeride of citronellol, but Bouveault showed that the isomerism must be chemical, and no doubt due to a difference in the position of the double linkings, rhodinol being—



whilst citronellol is—



The authors have now, by treating ethyl geraniate with sodium, according to Bouveault and Blave's method of converting esters into alcohols (this J., 1903, 888), obtained from it rhodinol; and as the constitution of ethyl geraniate has been established by complete synthesis to be—



the constitution of rhodinol must be that above given. Similar treatment of ethyl rhodinate, prepared from synthetic geranic acid by Tiemann's method, gave racemic rhodinol, agreeing with rhodinol from oils of rose or of pelargonium in all its characters save optical rotation. The natural and the synthetic rhodinol yield identical pyruvates, colourless oily substances of peculiar odour, boiling at 143° C. at 10 mm., and giving identical crystallised semicarbazones when treated with semicarbazide.—J. T. D.

Robinin; Study of the Glucoside —. N. Walliaschko. J. russ. phys.-chem. Ges., 1904, 36, 421—138; Chem. Centr., 1904, 1, 1609—1610.

THE robinin was prepared by boiling fresh acacia blossoms with water, or extracting the dried flowers with ether. It has the composition, $\text{C}_{25}\text{H}_{30}\text{O}_{10} \cdot 7\frac{1}{2}\text{H}_2\text{O}$; 7 mols. of water are easily split off, but the last $\frac{1}{2}$ mol. is evolved only at 110° C. On hydrolysis with mineral acids it yields almost quantitatively a yellow dyestuff, *robigenin*, $\text{C}_{15}\text{H}_{16}\text{O}_6 \cdot \text{H}_2\text{O}$, 2 mols. of rhamnose, and 1 mol. of galactose. Robigenin loses its water of crystallisation at 180° C. and melts at 270° C.; it belongs to the flavone group of dyestuffs.

—A. S.

Phenocoll; Detection of — in cases of Poisoning. A. Archetti. XXIII., page 763.

Carbon; Determination of —, by Sodium Peroxide and Barium Chloride in Explosive Compounds and Organic Bodies burning with difficulty [Alkaloids, &c.]. F. von Konek. XXIII., page 763.

Chloroform; Influence of Moist Alcohol and Ethyl Chloride on the Boiling Point of —. J. Wade and H. Finnemore. Chem. Soc. Proc., 1904, 20, 163.

CHLOROFORM, when made from alcohol, contains a small quantity of ethyl chloride, the absence of which from chloroform made from acetone detracts from its efficiency as an anæsthetic. The ethyl chloride depresses the boiling point of the chloroform; it was partially isolated by fractionation through a Young's evaporator column, and was identified by conversion into silver propionate. Incidentally, the authors have isolated binary mixtures of chloroform and alcohol, and chloroform and water, and a ternary mixture of chloroform, alcohol, and water, all of minimum boiling point. The first binary mixture boils at 59.4°/760 mm., has a sp. gr. 1.4125 at 15°/15°, and contains 7 per cent. of alcohol. The second binary mixture boils at 56.1°/mm., and contains about 1 per cent. of water. The ternary mixture boils at 55.5°/760 mm., and contains 4 per cent. of alcohol and about 3.5 per cent. of water. The water in both these mixtures separates at once from the distillate.

Electrically Extracting Essential Oil; Process and Apparatus for —. G. D. Burton, Assignor to Boston Leather Process Co. U.S. Pats. 763,151 and 763,152, June 21, 1904. XI. A., page 754.

FRENCH PATENT.

Meta-cresol; Process for Producing — from Crude Cresol. Chem. Fabr. Ladenburg, G. m. b. H. Fr. Pat. 339,880, Jan. 25, 1904.

THE process is based on the fact that the normal calcium salt of *m*-cresol is much less soluble in water or cresol than is the corresponding salt of *p*-cresol. Crude cresol may be saturated with calcium hydroxide, the mass which separates filtered off, and decomposed with acids, relatively pure *m*-cresol being obtained; if less calcium hydroxide be used

(e.g., an amount equal to that of the cresol employed) the resulting crystalline mass is freed from the mother liquor by washing with benzene, and is finally decomposed by means of acid.—T. F. B.

XXII.—EXPLOSIVES, MATCHES, Etc.

Carbon; Determination of — by Sodium Peroxide and Barium Chloride in Explosive Compounds and Organic Bodies burning with difficulty. F. von Konek. XXIII., page 763.

UNITED STATES PATENTS.

Explosive Compound. C. M. Hall, Niagara Falls, U.S.A.
U.S. Pat. 763,666, June 28, 1904.

THE explosive consists of silicon in an oxidisable condition and an oxidising agent.—G. W. McD.

Explosive Compound. C. M. Hall, Niagara Falls, U.S.A.
U.S. Pat. 763,665, June 28, 1904.

THE explosive consists of a finely powdered brittle alloy containing aluminium, iron, and silicon mixed with ammonium nitrate.—G. W. McD.

Explosive. W. Kirssanoff, Russia, Assignor to Société en Actions "Prométhée." Directeur Metchislaw Fiedler, Moscow, Russia. U.S. Pat. 763,675, June 28, 1904.

THE explosive consists of potassium chlorate (70 per cent.), potassium permanganate (20 per cent.), turpentine (9 per cent.), and carboic acid (1 per cent.).—G. W. McD.

XXIII.—ANALYTICAL CHEMISTRY.

INORGANIC—QUALITATIVE.

Alkali Fluorides; Detection of — in Foods.
J. Froidevaux. J. Pharm. Chim., 1904, 20 11.

ABOUT 30 grms. of the finely chopped material are cautiously incinerated in a platinum capsule with 1 or 2 c.c. of 50 per cent. sodium carbonate solution, until all the organic matter has been destroyed. The residue is powdered, boiled with 5 or 6 c.c. of distilled water for a few minutes in the same capsule and filtered; the filtrate is treated with excess of pure hydrochloric acid and a few drops of helianthin. Saturated solution of ammonium acetate is then poured into the mixture until the appearance of a yellow colour. One or 2 c.c. of calcium chloride are added; in the presence of fluorides a turbidity, or a precipitate will be formed. Under these conditions the free hydrochloric acid is completely saturated while acetic acid is liberated, which prevents the ultimate precipitation of the phosphates by the calcium chloride, and favours the precipitation of calcium fluoride.

The nature of the precipitate may be verified by heating the cloudy liquid, collecting, washing, and drying the precipitate and introducing it with sand and sulphuric acid into Sanglé Ferrière's apparatus. The reaction is sufficiently delicate to detect an admixture 0.05 per cent. of an alkali fluoride with meat or meat products.—J. O. B.

INORGANIC—QUANTITATIVE.

Sulphuric Acid; Determination of —, especially in presence of Iron. G. Lunge. Zeits. angew. Chem., 1904, 17, 949—953.

SILBERBERGER (this J., 1903, 1149, and 1904, 358) has contended, in favour of his method of precipitation by means of alcoholic solution of strontium chloride, that the author's method of determining sulphur in pyrites does not give accurate results, inasmuch as:—(1) in precipitating the ferric hydroxide, basic ferric sulphates are formed, from which the sulphuric acid cannot be washed out; (2) the barium sulphate precipitate contains barium chloride; (3) the filtrate contains barium sulphate, which is not absolutely insoluble in water or in the salt solutions concerned. The author claims that almost universal experience is against statement (1), and quotes the work of 22 of his

students, new to the method, and working solely from printed directions, 12 of whom succeeded completely in washing out the sulphur, while only three had serious errors (0.15 to 0.27 per cent.) from this cause. Experiments were instituted to test Silberberger's method on potassium sulphate and on pyrites (the author holds that Silberberger should not have used sulphuric acid without neutralising, for his test determinations, and that his determination of its strength by alkalimetric titration of 10 c.c. measured by a pipette is not exact enough). In the experiments with potassium sulphate the filtrations were exceedingly tedious, requiring several hours, and the filtrates were never quite clear, though the error from this cause was only 0.02—0.03 per cent. The strontium sulphate was free from chloride, and the concentrated filtrate gave no further indication of strontium sulphate. Similar experiments in presence of ferric chloride showed the same peculiarities in the filtration, and the wet precipitate was always buff-coloured, while many hours of ignition (during which it gained weight) were necessary to bring it to constant weight. The ignited precipitates varied in colour, but all contained 0.23—0.35 per cent. of their weight of Fe_2O_3 . Parallel experiments by Lunge's method, exactly as described in the "Alkali-maker's Pocket Book," gave, it is stated, rapid filtrations, clear filtrates, and precipitates constant after the first ignition, the whole operation requiring one-third to one-fourth of the time required for Silberberger's method. The results were 50.01, 49.63, 49.57 per cent., and the precipitates contained 0.43, 0.27, 0.42 per cent. of their weight of Fe_2O_3 . The results by Lunge's method were 49.82, 49.87 per cent., with corrections under head 1, of 0.0; under head 2, of -0.01, -0.04; under head 3, of +0.06, +0.07 per cent.

The author's conclusions are that his method gives results of satisfactory accuracy without any correction, and that the known errors are very small and in opposite directions, while no error should arise from the retention of sulphur by the ferric hydroxide; but that Silberberger's method, said to be very troublesome, and costly from the amount of alcohol needed, though it gives satisfactory results when iron is absent, cannot be used for pyrites, as the results may differ by 0.5 per cent., from the retention of iron by the precipitate and the difficulty of attaining constant weight on ignition.—J. T. D.

Palladium; Separation of — from other Metals, by means of Hydrazine. P. Jannasch and L. Rostovsky. Ber., 1904, 37, 2441—2461.

Group 1. From Aluminium, Chromium, Uranium, Molybdenum, and Tungsten.—To the mixture, containing just enough hydrochloric acid to preserve a clear solution (and, in the case of tungsten, 2 grms. of tartaric acid), diluted to 300 c.c., and heated to boiling, add 30 c.c., also boiling, of a solution of hydrazine sulphate saturated in the cold. Heat on the water-bath for a few minutes till the precipitate collects together, filter through asbestos in a hard glass tube, wash dry at 110°—120° C., reduce any palladious oxide by ignition in hydrogen, and weigh. In the filtrate, aluminium, chromium, or uranium, is determined by precipitation with ammonia, molybdenum by addition of ammonia and ammonium sulphide followed by hydrochloric acid, and conversion of the sulphide into trioxide by heating in air or oxygen, tungsten by adding to the filtrate 20 c.c. of concentrated hydrochloric acid, evaporating to small bulk, diluting, filtering off the separated tungstic acid and wash, ing with water containing hydrochloric acid, evaporating the filtrate to dryness, completely charring the tartaric acid, extracting thoroughly with ammonia, precipitating the ammoniacal solution with quinoline, and igniting this and the former precipitate of tungstic acid together. In none of these cases does the excess of hydrazine salt interfere.

Group 2. From the Alkaline Earth Metals.—The process is similar to the above, except that (unless for dilute solutions of calcium) hydrazine hydrochloride must be used. The excess of hydrazine salt exerts no influence on the determination of barium or strontium as sulphate, or of calcium as oxalate.

Group 3. From Manganese, Nickel, Cobalt, Cadmium, and Copper (also Zinc and Iron, see this J., 1904, 729).—These

metals form difficultly soluble metal hydrazine sulphates, which it was thought would interfere with the process by precipitating with the palladium; but the separation from manganese or cadmium is effected exactly as above, and from nickel or cobalt by dilution to 100 c.c., before precipitation, instead of 300. Manganese is precipitated in the filtrate by hydrogen peroxide, nickel or cobalt by sodium hydroxide and hydrogen peroxide, cadmium by hydrogen sulphide. In no case does the excess of hydrazine salt interfere. In the case of copper, though this metal alone is not precipitated by hydrazine salts, yet it always came down with the precipitated palladium, reduced, no doubt, by the catalytically formed hydrogen. The authors hope to effect a separation by working in the cold, but have not yet perfected the method.

Group 4. From Antimony, Arsenic, and Tin.—In the case of antimony, 6 grms. of citric acid are added to the solution, which is diluted to 150 c.c., and precipitated as usual; the heating on the water-bath, after precipitation is limited to five minutes, and the filtrate returned if necessary upon the filter till clear. The antimony is precipitated and weighed as sulphide. Arsenic must be converted from the arsenious to the arsenic condition, then the precipitation with hydrazine, can be carried out as in the case of aluminium. The arsenic can be determined in the concentrated filtrate as magnesium ammonium arsenate, without removing the excess of hydrazine. In the case of tin, the solution is evaporated to dryness, taken up with 10 c.c. of concentrated hydrochloric acid, diluted to 140 c.c., and precipitated hot with a solution of 1 gm. of hydrazine hydrochloride in 20 c.c. of water. Precipitation does not occur for some minutes, and the precipitate can only be filtered after 1–2 hours on the water-bath, even then requiring several passages through the same filter before the filtrate is clear. This precipitate is practically pure metallic palladium. The tin is precipitated as sulphide.

Group 5. From Mercury, Lead, Bismuth, Silver, Platinum, and Gold.—In none of these cases could a separation be effected.—J. T. D.

Palladium; Determination of — and its Separation from other Metals by means of Acetylene. H. Erdmann and O. Makowka. Ber., 1904, 37, [11], 2694–2697.

The authors publish a preliminary note, pointing out that the separation by means of hydrazine proposed by Jannasch, Belges, and Rostovsky (this J., 1904, 729, and preceding abstract) is not suitable for palladium. To separate palladium and copper, the present authors proceed as follows:—The palladium is precipitated from hydrochloric acid solution (about 1 c.c. of hydrochloric acid of sp. gr. 1.05 to 30–60 c.c. of solution) by passing in acetylene for 15 minutes. The light brown precipitate is filtered, washed, put whilst still moist into a porcelain crucible, and ignited after the addition of a little ammonium nitrate. After heating for a few minutes in a current of hydrogen it is weighed. To the filtrate, ammonia, and 1 c.c. of a 10 per cent. solution of hydroxylamine chloride are added, and acetylene passed for five minutes. The precipitate is filtered off, washed, and ignited after evaporation with dilute nitric acid. The palladium thus separated is free from copper, and the copper is free from palladium.

—L. F. G.

Arsenic; The Electrolytic Determination of Minute Quantities of —. H. J. S. Sand and J. E. Hackford. Chem. Soc. Proc., 1904, 20, 123.

A HIGH supertension of the cathode is requisite for the reduction of arsenic acid to metallic arsenic, the reaction being most readily effected in the presence of metals having this property, such as lead or zinc, and probably also mercury. The production of arsenic trihydride from arsenites is accomplished more readily by platinum cathodes than by those of copper, which have a much higher supertension. The authors recommend the use of lead electrodes for the determination of minute quantities of arsenic, as their application causes a simplification of previous methods. Errors which may arise in the electro-

lytic methods owing to the presence of foreign metals can be rectified by the addition of lead acetate or zinc sulphate to the electrolyte except when the foreign metal is mercury. When lead and zinc cathodes are used, the smallest amount of arsenic which can be detected in alkaline solutions of arsenates and arsenites is about 30 times as great as in acid solution, but cathodes of platinum (which has a low supertension) are quite unsuitable.

Potassium Permanganate; Standardisation of — by the Electrolytic and Iodine Methods. F. Dupré. Zeits. angew. Chem., 1904, 17, 815–817.

POTASSIUM permanganate solutions which had been kept for at least a month, that is, until they no longer changed in strength, were examined by (a) Treadwell's electrolytic method (Z. anal. Chem., 2, 68) and (b) Volhard's iodine method (Annalen, 198, 333 and 318; Z. anal. Chem., 20, 274). Results are given showing that the electrolytic method is quite trustworthy.—R. L. J.

Calclines; Analysis of —. J. P. Walker. Eng. and Mining J., 1904, 77, 922.

For the analysis of the calclines, obtained by roasting in the McDougal furnace, fine concentrates having a composition corresponding to the formula $\text{Cu}_2\text{S} \cdot 6\text{FeS}_2$, the following determinations were made, the figures being those obtained in an actual analysis:—Total copper, 12.0; copper soluble in 20 per cent. sulphuric acid, 6.8; silica, 23.6; total iron, 35.0; iron present as ferrous oxide, 15.0; alumina, 7.6; total sulphur, 9.7; sulphur soluble in water, 0.4 per cent. Copper oxide was proved to be absent, therefore the copper soluble in sulphuric acid is taken to be that present as cuprous oxide. The ferrous oxide was determined by boiling 4.5 grms. of the sample for 15 minutes with 0.2 per cent. sulphuric acid in a flask fitted with a valve, filtering and titrating with permanganate, a correction being made for the ferrous iron produced by the action of the cuprous oxide, according to the equation: $\text{Cu}_2\text{O} + \text{Fe}_2(\text{SO}_4)_3 + \text{H}_2\text{SO}_4 = 2\text{CuSO}_4 + 2\text{FeSO}_4 + \text{H}_2\text{O}$. The actual composition of the sample under notice was then deduced as follows:—Silica, 23.6; alumina, 7.6; sulphur trioxide (from sulphur soluble in water), 1.0; cuprous oxide (from copper soluble in 20 per cent. sulphuric acid), 7.7; cuprous sulphide (from total copper less that in the form of cuprous oxide), 6.5; ferrous oxide, 20.6; pyrites, FeS_2 (from total sulphur less that present as cuprous sulphide and sulphur trioxide), 15.0; ferric oxide (from total iron less that present as ferrous oxide and pyrites), 17.0; total, 99.0 per cent.—A. S.

Sulphur in Golden Antimony Sulphide used for Rubber Manufacture; Determination of —. W. Esch and F. Balla. Chem.-Zeit., 1904, 28, 595–596.

Two portions of golden antimony sulphide, weighing exactly 10 grms., were extracted in a Soxhlet apparatus, one with carbon bisulphide, the other with acetone. On evaporating the solvent and weighing the sulphur, 1.04 grms. and 1.05 grms. of extracted sulphur were found, corresponding to 10.4 and 10.5 per cent. The acetone extract was found to contain some golden antimony sulphide which had passed through the filter paper. On attempting similarly to determine the loss in weight of two samples on extracting with carbon bisulphide and acetone, drying and weighing the residue, the dried antimony sulphide was found to retain acetone. C. O. Weber has stated that antimony pentasulphide is decomposed into sulphur and antimony trisulphide on boiling with carbon bisulphide. This was shown to be erroneous by adding a weighed quantity of sulphur to antimony sulphide that had been extracted for one hour with carbon bisulphide, and extracting for four hours with carbon bisulphide. A quantity of sulphur exactly equal to that added was extricated. The carbon bisulphide used had been twice distilled over lead oxide, lead dust, and mercury. Ordinary impure carbon bisulphide slightly decomposes golden antimony sulphide, causing a loss of about 0.27 per cent. Benzene is not so suitable a solvent as carbon bisulphide.—L. F. G.

Nickel from Zinc; Electrolytic Separation of —.
Holland and Bertiaux. *Comptes rend.*, 1904, 138, 1605.

THE authors have already shown that the electrolytic separation of these two metals, impracticable by the ordinary methods because of the similar values of their polarisation-tensions, becomes possible by the employment of a soluble anode or by the addition of a reducing substance to the bath. They now find that zinc ammonium nitrite is a complex salt, does not yield zinc ions in solution, and hence is not an electrolyte; and they accordingly separate zinc from nickel as follows:—To the solution of the sulphates add successively 5 grms. of magnesium sulphate, 25 c.c. of ammonia (sp. gr., 0.924), dilute sulphuric acid to acidity, 12.5 grms. of ammonium nitrate, and 25 c.c. of a saturated solution of sulphur dioxide. Boil till all sulphur dioxide is expelled, dilute with water, add 25 c.c. of the ammonia solution, make up to 300 c.c., and electrolyse at 85° C. with a current of 1 ampère. The results of analyses quoted are accurate.—J. T. D.

Molybdenum in Steel and Steel-making Alloys; Determination of —. F. Van Dyke Cruser and E. H. Miller. *J. Amer. Chem. Soc.*, 1904, 26, 675–695.

THE authors find that in the separation of molybdenum from iron by precipitating the latter as hydroxide, sodium hydroxide is more efficient than ammonia, but with both reagents the results are too high, owing to the formation of a ferric molybdate, which is slightly soluble in excess of alkali. Moreover, vanadium, uranium, and tungsten, if present, are not separated from molybdenum by this method. Molybdenum can be completely precipitated in presence of iron from an acid solution by hydrogen sulphide under pressure. The precipitate carries down mechanically a little iron, which must subsequently be removed by means of ammonia. Any chromium, vanadium, and uranium present remain in solution, and tungsten also, if 3–4 grms. of tartaric acid be added. It is pointed out that, contrary to what is stated in most text-books, tungsten trioxide is quite soluble in acids. The following method of working is recommended:—

Molybdenum Steel.—About 1 gm. of drillings is dissolved in 80 c.c. of “silicon mixture” (500 c.c. of concentrated nitric acid, 150 c.c. of concentrated sulphuric acid, and 1,500 c.c. of water), the mixture evaporated till fumes of sulphur trioxide appear, cooled, and the salts dissolved by adding 50 c.c. of hot water, and boiling. The solution is introduced into a pressure-bottle, 6 c.c. of concentrated sulphuric acid added, the whole diluted to about 200 c.c., and a very rapid stream of hydrogen sulphide passed through. The bottle is then closed, heated on the water-bath for 1–2 hours, allowed to cool, the contents filtered through a Gooch crucible with the aid of the pump, and the precipitate washed with dilute (1:50) sulphuric acid saturated with hydrogen sulphide. The asbestos and precipitate are removed from the crucible, treated with 10 c.c. of concentrated hydrochloric acid, 5 c.c. of concentrated nitric acid, and 10 c.c. of concentrated sulphuric acid, and the mixture evaporated till copious fumes of sulphur trioxide are evolved, air being meanwhile blown through the solution. The solution is then allowed to cool, 50 c.c. of water and excess of ammonia are added, and the asbestos and any precipitated ferric hydroxide are filtered off and washed with hot water. The filtrate is acidified, passed through a “reductor” containing unamalgamated zinc, and the molybdenum determined by titration with potassium permanganate solution, the conditions prescribed by Miller and Frank (this J., 1903, 1149) being observed. When tungsten is present it separates, partially, as tungsten oxide, when the acid solution first obtained is evaporated. It may be recognised by dissolving the deposit in ammonia, making strongly acid with hydrochloric acid, and adding a saturated hydrochloric acid solution of stannous chloride, followed by ammonium thiocyanate. A deep green colour indicates the presence of tungsten. If tungsten be present, the acid solution, after being evaporated as before, is cooled, treated with 50 c.c. of water and 5 grms. of tartaric acid, heated to boiling, and filtered into the pressure-bottle. The residue is

washed with hot water, then again treated with the “silicon mixture” and tartaric acid as before, the solution filtered into the pressure-bottle, and the method described above followed.

Ferromolybdenum.—4–5 grms. are dissolved in 180–200 c.c. of “silicon mixture,” the solution allowed to cool, diluted to 1 litre, and 50 or 100 c.c. treated as in the case of molybdenum steel.

Molybdenum Metal.—2–3 grms. are dissolved in “silicon mixture,” concentrated hydrochloric acid added, the mixture heated for some time, diluted with water, and filtered into a litre flask. The filter is burnt, moistened with nitric acid in a platinum crucible, using as low a heat as possible, and the residue fused with potassium pyrosulphate. The melt is dissolved in hot water, the solution added to that in the litre flask, the whole made up to the mark, and 50 c.c. treated as in the case of molybdenum steel.—A. S.

Soil Acidity; Comparison of Methods for the Determination of —. F. P. Veitch. *J. Amer. Chem. Soc.*, 1904, 26, 637–661.

THE two methods examined were the sodium chloride method of Hopkins, Pettit, and Knox, and the author's lime-water method. The first method consists in shaking 100 grms. of soil with 250 c.c. of 5 per cent. sodium chloride solution for three hours, filtering and titrating 125 c.c. of the boiled filtrate with standard alkali solution, using phenolphthalein as indicator. The amount of alkali used, multiplied by 4, is that required to neutralise 100 grms. of the soil. In the second method, three equal portions of the soil (each containing as many grms. as the standard lime water contains mgrms. per c.c.) are mixed with 50 c.c. of distilled water and varying amounts of standard lime water, and evaporated to dryness at 100° C. The residues are allowed to stand for 12 hours with 100 c.c. of water, and 50 c.c. of each solution is evaporated down, after addition of a few drops of phenolphthalein, to a volume of 5 c.c., or until a pink colour is produced. This process is repeated on fresh portions of soil, the differences in the amounts of lime-water used being gradually diminished until the least quantity of lime water which gives a pink colouration is found; this quantity is taken as the acidity equivalent of the soil. It is found that, as the soils tested contain more organic matter, so the results obtained by the two methods become more divergent, the former method showing the lower acidity. Soils containing little organic matter may give higher acidity values by the former method, but it is concluded that this method will not generally indicate the necessity for sufficient lime dressing, hence, the second method is more desirable as giving a true indication of the amount of lime required to render the soil slightly alkaline.—T. F. B.

Arsenic; Separation of — by Distillation in Hydrogen Chloride. G. T. Morgan. *Chem. Soc. Proc.*, 1904, 20, 167.

A MODIFICATION of Piloty and Stock's apparatus (Ber., 1897, 30, 1649) was described in which the mixed sulphides of arsenic and antimony were distilled in a current of hydrogen chloride, so that the vapours did not come into contact with organic matter until after passing through a cooled aqueous solution of hydrogen sulphide. In dealing with a mixture containing arsenic in the two states of oxidation, the distillation was first carried out in hydrogen chloride, when the arsenious sulphide precipitated in the receiver represented the trivalent arsenic. On repeating the distillation of the residual liquid in a current of hydrogen chloride mixed with hydrogen sulphide a second precipitation of arsenious sulphide was obtained, this being derived from the arsenic originally present in the quinivalent condition.

Carbon; Determination of — by Oxidation with Chromic Acid. G. T. Morgan. *Chem. Soc. Proc.*, 1904, 20, 167.

PHOSPHORIC acid was substituted for sulphuric or hydrochloric acid in the gravimetric estimation of carbon dioxide in native carbonates, and when these substances contained

organic matter, chromic acid was subsequently added to the contents of the distilling flask and the operation repeated, the second increase in weight of the tared absorption tube being due to the oxidation of the organic carbon. The mixture of chromic and phosphoric acids was also used in estimating the total carbon in cast iron and ferromanganese, the employment of a non-volatile acid instead of sulphuric acid obviating the risk of carrying over acid fumes into the weighed absorption tube.

ORGANIC—QUALITATIVE.

Thiophene Reaction with Nitroso-sulphuric Acid. C. Liebermann and B. Pleus. Ber., 1904, 37, 2461—2464.

SCHWALBE found that certain benzenes from coke-ovens, which showed thiophene with the isatin reaction, did not give any indication of it with Liebermann's reagent, and assumed that this was caused by the presence of some hitherto unknown substance which affected the reaction. The authors have carefully examined these benzenes, and find that the explanation lies in the fact that they contain very little thiophene, and that the isatin reaction is much more delicate than that with nitroso-sulphuric acid. They also find, contrary to the statement of Bauer, that the indophenin reaction is given by pure sulphuric acid, free from nitrous or nitric compounds.—J. T. D.

Grease Oleines [Wool Oils]; Detection of Mineral Oil in Distilled. A. H. Gill and S. N. Mason. J. Amer. Chem. Soc., 1904, 26, 665—671.

THE authors sought to find methods of detecting adulteration of distilled grease oleines with cheaper mineral oils. They find: (1) the bromine values, especially the bromine-addition values (this J., 1900, 176) of the hydrocarbons from pure oleines, are much higher than those of mineral oils; (2) the grease oleine hydrocarbons give a rotation of 16° — 18° in the Laurent polariscope, whilst mineral oils are inactive or give only a slight rotation (1° — 2°); (3) the indices of refraction of mineral oils are lower than those of the distilled grease hydrocarbons. The following were some of the results obtained:—

Nature of Oil.	Bromine-addition Value.	Bromine-substitution Value.	Optical Rotation.	Specific Gravity.	Refractive Index at 20° C.
Pure Oleines { A.....	28.8	14.2	17 58	0.896	1.4967
B.....	25.1	14.8	17 36	0.902	1.4991
C.....	21.5	16.8	15 13	0.895	1.4946
Oleins of doubtful purity, D.	3.8	9.0	2 56	..	1.4921
"White Rose," } Mineral-oils.	5.3	5.9	1 6	0.853	1.4735
"Eagle neutral," }	4.4	6.7	1 17	0.859	1.4750
Mixture of 50 per cent. of A. and 50 per cent. of "white rose."	9.0	12.85	9 47	..	1.4850

—A. S.

Alcohols; Purification and Identification of. L. Bouveault. Comptes rend., 1904, 138, 984—985.

THE identification of liquids is always difficult and uncertain; a mixture of isomers may be confounded with a definite substance. This difficulty is felt in a high degree with alcohols, most of which are liquid, and only separable from one another by methods of fractionation. The various methods proposed for converting alcohols into other compounds for identification are of very limited application; and the author now extends the limits by making use of the pyruvic esters. These, if primary or secondary, can frequently be prepared by simply heating together the alcohol and pyruvic acid for some time, and then distilling; though some unsaturated alcohols (geraniol for example) are decomposed by this process. Tertiary alcohols seem all to be decomposed by pyruvic acid, and yield alkylene hydrocarbons (a useful method of preparing the latter).

The pyruvates all react energetically with semi-carbazide, and the semi-carbazones produced are stable well-crystallised substances, each with its characteristic constants. By their means the alcohols can be identified (and, if necessary, purified). Treatment with alcoholic potassium hydroxide regenerates the alcohol.—J. T. D.

Morphine Reaction; New. C. Reichard. Pharm.-Zeit., 1904, 49, 528. Chem.-Zeit., 1904, 28, Rep. 195.

IF to a mixture of formaldoxime sulphate and sulphuric acid, a trace of morphine or a morphine salt be added, an intense bluish violet colour is produced on warming. Atropine also gives a reaction with formaldoxime and sulphuric acid, a dark brown colour being produced, which however is destroyed on the addition of a few drops of water. A greater quantity of water is required to destroy the colour produced with morphine.—A. S.

Phenocoll; Detection of — in Cases of Poisoning. A. Archetti. Chem.-Zeit., 1904, 28, 597—593.

PHENOCOLL or aminoaceto-p-phenetidine —



is a white powder of m. pt. 105.5° C., soluble in alcohol, soluble with difficulty in water, benzene, and chloroform. The aqueous solution gives a reddish-yellow precipitate with bromine water. It is soluble in concentrated sulphuric acid on warming, on adding potassium chromate a brown coloration, changing to green, is produced. On evaporating a little phenocoll with a few drops of caustic potash solution, neutralising with hydrochloric acid, and adding ferric chloride, a deep violet colour is produced. The reaction takes place in accordance with the following equation—



On shaking an aqueous solution of phenocoll hydrochloride with ether, no phenocoll can be extracted. On adding caustic alkali, it readily passes into the ethereal extract. In the body, phenocoll is decomposed into p-aminophenol and glycin, in accordance with the above equation.—L. F. G.

Lard; Crystals obtained in the Belfield Test for. H. Kreis and A. Hafner. XII., page 755.

ORGANIC—QUANTITATIVE.

Carbon; Determination of — by Sodium Peroxide and Barium Chloride in Explosive Compounds and Organic Bodies burning with difficulty [Alkaloids, &c.]. F. von Konek. Zeits. angew. Chem., 1904, 17, 888—891.

A SOLUTION of crystallised barium chloride (101.67 grms. per litre) is made use of, each c.c. being equivalent to 0.005 gm. of carbon in the form of barium carbonate. 0.5 gm. of the finely divided substance (in case of bodies not easily combustible 0.25 gm.) is intimately mixed with a weighed quantity of sodium peroxide (10—12 grms.) in a crucible and ignited. The mass when cool is dissolved and made up to 500 c.c. with water free from carbon dioxide. 100 c.c. or 200 c.c. of this solution (equivalent to 0.10 gm. of the organic body) are transferred to a 250 c.c. flask, and 20—25 c.c. of the barium chloride solution added and well agitated. The precipitated barium carbonate is filtered off through a dry filter and in 100 c.c. of the filtrate, the excess of barium chloride is estimated as sulphate, the difference being the barium chloride required to precipitate the carbonate formed during the reaction. The absence of sodium carbonate in the peroxide should be determined by a blank experiment. Alkaloids and picric acid were analysed as above with satisfactory results.—G. W. McD.

Phosphorus and Nitrogen; Determination of — in Organic Bodies by means of Sodium Peroxide. F. von Konek. Zeits. angew. Chem., 1904, 17, 886—888.

THE material is ground in an agate mortar sifted through the finest gauze, and 0.5 gm. mixed with 10—15 grms. of

sodium peroxide in a nickel crucible. The latter is placed in water in a basin and ignited in the usual manner. The melt is then dissolved out, filtered, acidified with hydrochloric acid, heated to drive off carbon dioxide, rendered alkaline with ammonia and precipitated with magnesia mixture. For the determination of nitrogen the same procedure is followed, but the aqueous extract containing the sodium nitrate is reduced in Devarda's apparatus by an aluminium-copper couple and estimated as usual.

—G. W. McD.

Briquettes; Determination of Proportion of Binding Material in —. E. J. Constam and R. Rougeot. *Zeits. angew. Chem.*, 1904, 17, 845—848.

SAMPLES of various pitches used in briquette manufacture were examined with the results enumerated in the following table.

Samples.	Softening Point.	Melting Point.	Coke.	Ash.	Soluble in Carbon Bisulphide.
	° C.	° C.	Per Cent.	Per Cent.	Per Cent.
German (23) ..	37—62.5	44—60	25—50	0.04—2.5	60—91
English (6) ...	43—55	52—61	40—50	0.12—0.8	66—79
Dutch (3)	45—52	52—59	50—53	0.15—0.19	63—64
Swiss (1)	53	61	35	0.27	67.8

For the determination of the carbon bisulphide extract, 1—2 grms. of the finely-divided pitch are mixed with about 10 times the amount of ignited sand and extracted for 72 hours in a Soxhlet apparatus, the extract being finally dried *in vacuo* for 4—5 days over phosphorus pentoxide. The plastic condition and the binding power of a pitch are in proportion to its solubility in carbon bisulphide. The carbon bisulphide extract of all the samples of pitch examined gave a mean of 76.3 per cent. and as in general about 7 per cent. of pitch is used in briquette manufacture the authors select 5.34 per cent. carbon bisulphide extract from a briquette as showing sufficiency of binding material, a conclusion confirmed by transport and compression tests. For the estimation of the carbon bisulphide extract from a briquette 10 grms. of the finely-divided material are extracted under similar conditions as described above except that no sand is required.—G. W. McD.

Gases containing Hydrogen; Fractional Combustion of — by means of Heated Palladium Wire. F. Richardt. *J. f. Gasbeleucht.*, 1904, 47, 566—570 and 590—595.

THE author has studied the behaviour of hydrogen, methane, ethane, and ethylene respectively, when mixed with air and passed over palladium wire. At temperatures up to 450° C., methane is found not to be attacked; above that temperature, even below a visible red heat, an appreciable proportion of the gas undergoes combustion, if it remains long enough in contact with the palladium; but if the current is led quickly over the palladium, practically none of the methane is burned even at 600°—650°. The delay in ignition thus indicated, finds its explanation in the observation of Mallard and Le Chatelier that explosive mixtures of methane and oxygen, when raised to the ignition temperature, do not explode at once, the retardation in the ignition amounting, at 600°—700° C., to about 10 seconds, but diminishing with rise of temperature, until at 1000° it is imperceptible. Any hydrogen present with the methane is burned completely at 450° C., even if the contact with the palladium wire be short. The presence of hydrogen does not affect the combustion of the methane, excepting that the retardation in the ignition disappears, on account of the rise of temperature caused by the combustion of the hydrogen. Ethane behaves on the whole in the same way as methane: these two gases cannot be separated by practical combustion. Ethylene begins to burn even at 300°, but cannot be fractionated from methane or ethane, as the ignition temperature of these two gases would be overstepped. In the determination of hydrogen by Bunte's method (which consists in passing the gas, mixed with air, through a heated capillary tube containing palladium

wire, and noting the contraction in the volume of the gas), the temperature has to be carefully regulated. If, as is commonly recommended, the palladium is heated just to visible redness, a sensible amount of the methane is burned. If, however, the tube is heated just until the alkali of the glass colours the Bunsen flame, and the gas is led quickly through the tube, no methane is burned, whilst the hydrogen disappears completely. One passage of the gas is sufficient; but it may safely be led over again if desired, at even a higher temperature, since in the absence of hydrogen the retardation in the ignition protects the methane from attack.—H. B.

Cocoonut Oil in Butter; Determination of —. A. Müntz and H. Coudon. *Monit. Scient.*, 1904, 18, 530—541.

THE method proposed consists in determining the amount of insoluble volatile fatty acids yielded by the sample and also the ratio which these bear to the soluble volatile fatty acids. 10 grms. of the filtered fat are saponified in a flask by adding 5 c.c. of warm concentrated potassium hydroxide solution. The latter is of such strength that it forms a saturated solution at 20° C. (about 120 grms. of potassium hydroxide to 100 c.c. of water). The mixture of fat and alkali is well mixed and kept at a temperature of 80° C. for 20 minutes, after which 200 c.c. of water are added and the soap completely dissolved by shaking the contents of the flask. Thirty c.c. of phosphoric acid solution (sp. gr. 1.15) are then introduced and the mixture freed from carbon dioxide by subjecting it to a reduced pressure at a low temperature. The flask is now connected to a condenser by means of a spiral fractionating tube, the total length of the latter being 1 metre, and the distillation proceeded with. A few pieces of pumice or pipe-clay must be added to prevent bumping. Two hundred c.c. of distillate are collected and the distillation should take about an hour and a half. The distillate is allowed to stand overnight, and is then passed through a moistened filter, the receiver being rinsed out with 5 c.c. of water. One hundred c.c. of standardised lime-water are then added directly to the filtrate and the neutralisation completed by running in further quantities of the lime-water from a burette, using phenolphthalein as indicator. The volume of lime-water used is then calculated into butyric acid.

The insoluble volatile fatty acids obtained by the distillation are dissolved from the condenser, receiver, and filter with alcohol, and the solution titrated with the standardised lime-water, the volume of the latter used being calculated into butyric acid.

Pure butters when examined according to the above method, yielded from 4.79 to 6.01 per cent. of soluble volatile fatty acids (as butyric) and from 0.50 to 0.87 per cent. of insoluble volatile acids, whilst various samples of cocoanut oil gave from 1.15 to 1.27 per cent. of soluble volatile acids and 3.01 to 3.63 per cent. of the insoluble volatile acids. The authors also calculate the ratio of soluble to insoluble acids according to the formula—

$$\frac{\text{insoluble volatile acids}}{\text{soluble volatile acids}} \times 100$$

This gives a value varying from 9.1 to 15.6 in the case of butter, whilst for cocoanut oil it lies between 250.3 and 282.3. A sample of margarine yielded 0.04 per cent. of soluble volatile acids and 0.16 per cent. of insoluble volatile acids. (See also this J., 1904, 387.)—W. P. S.

Crude Rubber; Examination of —. G. Fendler. *Ber. d. d. Pharm. Ges.*, 1904, 14, 208; *Pharm. J.*, 1904, 73, 10.

THE rubber cut into fine shreds is dried in a desiccator over sulphuric acid. Two grms. of the dried rubber are dissolved in petroleum spirit (in about 24 hours), the solution made up to 100 c.c., and, after a short time, filtered through a tared filter consisting of a tube containing a layer of glass wool 1—2 cm. high. Fifty c.c. of the filtrate are collected, and the residue is washed, dried, and weighed. The 50 c.c. of filtrate are shaken with 70 c.c. of absolute alcohol, the precipitated caoutchouc washed by kneading with a small amount of alcohol, dried, and weighed.

The solutions and washings are evaporated and the residual resin weighed. The following results have been obtained by this method.

	Caoutchouc.	Resin.	Insoluble (Impurities).
	Per Cent.	Per Cent.	Per Cent.
Rubber from <i>Castilloa elastica</i>	89.25	10.25	0.90
" " " "	84.85	14.30	0.80
Sapum rubber " " " "	90.55	7.10	2.35
Rubber from <i>Manihot Glaziovii</i>	70.80	4.90	24.45
Rubber from <i>Hevea</i> sp.	80.00	2.30	18.20
Euphorbiaceous rubber	90.80	4.45	3.25

—A. S.

India Rubber; Weber's Method for the direct Determination of —. Paul Alexander. *Gummi-Zeit.*, 1904, **18**, 789—791. See Weber, this J., 1903, 1211.

The author found it necessary to deviate from Weber's instructions a little in order to get satisfactory results. One to two grms. of the sample previously extracted with acetone and alcoholic caustic soda, are placed in the decomposition flask with only just sufficient alcohol-free chloroform to cover the bottom of the gas-inlet tube. Nitrogen peroxide from 50 grms. of lead nitrate is then passed through in a rapid stream. After standing some hours, the chloroform is removed by immersing the flask in lukewarm water whilst drawing a current of dry air through the flask.

The dry reaction product is dissolved in acetone and the solution filtered. The solution is then evaporated to a small volume (not more than 20 c.c.), and poured into 250 c.c. of 10 per cent. ammonium chloride solution and allowed to stand over night in order to allow oily products time to solidify. The further treatment is precisely according to Weber's method. Benzene cannot be substituted for chloroform as the tendency is much greater for the addition product to settle in an oily condition. The author found it essential to use twice as much lead nitrate as recommended by Weber, also that it is important to keep the volume of the acetone solution as low as possible before

pouring into the ammonium chloride solution, otherwise difficulty is encountered in obtaining a solid product.

—J. K. B.

Tannin; Determination of — without Hide Powder. H. Wislicenus. *Z. angew. Chem.*, 1904, **17**, 801—810.

The author describes the physical properties and chemical behaviour towards tanning agents, of a highly porous aluminium oxide and hydroxide, which show by their attraction for the tanning agents a certain analogy to the action of raw hide, and the use of these materials is thus suggested in the analysis of tan stuffs. The metallic compounds resulting from the use of the two substances are called tannal or tannalith.

Preparation.—Aluminium powder (100 grms.) is shaken in a capacious beaker with a 5 per cent. solution of caustic soda, the liquor being decanted off in a short time, fresh caustic soda added, and drained off, and the residue well washed by decantation. To the last washing water a small quantity of mercuric chloride is added, the white powdery hydroxide is drained and dried with alcohol and ether. The mass is then passed through a fine sieve (0.5 mm. mesh) to remove oxide and metal if any, which can be afterwards worked up as before. Alternatively, the aluminium may be at once treated with ethereal solution of mercuric chloride, then, with the calculated amount of water, and dried with alcohol and ether. The oxide is produced by heating the hydroxide in a flat porcelain dish.

Mode of Using.—2.5—3 grms. of the hydroxide or 2—2.5 grms. of the oxide are gradually added to 100 c.c. of the liquor to be analysed, well shaken, and left to stand for a few hours. The clear liquor may be tested with an iron salt to ascertain that absorption is complete. Fifty c.c. of the clear liquor are drawn off and evaporated to determine non-tannins and by subtraction from the contents of 50 c.c. of original liquor the tannins are calculated. Further, if a known weight of oxide be employed, the tannalith may be dried and weighed and the increase in weight noted; or the tannalith may be ignited and the loss observed, as checks on the estimation of tannin by difference.

Some of the analytical results compared with hide-powder determinations are shown in the following table, the quantities being grms. per 100 c.c.

Liquor.	Hide Powder.		Aluminium Hydroxide.		Aluminium Oxide.		Original Total Soluble.
	(a.)	(b.)	(a.)	(b.)	(a.)	(b.)	
	Grms.	Grms.	Grms.	Grms.	Grms.	Grms.	Grms.
(1) "Tannic acid" { Tannin	0.1238	0.1301	0.1235	0.1285	0.1297	0.1294	0.1321
{ Non-tannin	0.0034	0.0018	0.0037	0.0034	0.0025	0.0025	
(2) Gallic acid .. { Tannin	0.0339	0.0358	0.1306	0.1314	0.1298	0.1312	0.1369
{ Non-tannin	0.1026	0.1015	0.0050	0.0050	0.0067	0.0061	
(3) Pine bark ... { Tannin	0.0043	0.0046	0.1119	0.1107	0.1063	0.1075	0.1871
{ Non-tannin	0.0803	0.0837	0.0737	0.0770	0.0793	0.0802	
(4) Oak bark { Tannin	0.3984	..	..	..	0.3047	..	..
{ Non-tannin	0.2144	..	..	..	0.1965	..	..
(5) Chestnut .. { Tannin	0.5000	..	..	..	0.5001	..	..
extract { Non-tannin	0.1000	..	..	..	0.1002	..	..

The advantages claimed for the method are the certain and simple preparation of the material and its regular quality, its complete absorptive power, small quantity necessary, capability of being washed free from non-tannins and of being weighed, its similarity in action to hide-powder, and, in addition, the fact that no special apparatus is required.—R. L. J.

Reducing Sugars; Potassium Bromide as Indicator in the Determination of — with Fehling's Solution. P. Berti. *Bull. Assoc. Chim. Sucr. et Dist.*, 1904, **21**, 1234—1236.

In two small crystals of potassium bromide be placed on a porcelain plate, and, whilst moistening one with a drop of water, the other be moistened with a drop of a solution of copper sulphate of 0.005 per cent. strength, and then if each crystal be touched with a drop of concentrated pure sulphuric acid, the first will be observed to turn yellow, due to the formation of free bromine, whilst the

second acquires a violet tint, due to the formation of anhydrous copper bromide. Potassium bromide may thus be used to indicate the final limit of the reaction with Fehling's solution applied, e.g., in determining the reducing sugars in molasses. A drop of solution is placed on two superposed pieces of filter paper resting on a porcelain plate. A crystal of potassium bromide is then placed on the moistened spot on the plate and a drop of sulphuric acid added. The violet coloration ensues as long as copper is present. The results are within the limits of commercial work.—L. J. de W.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Zinc Blende; Luminescent —. A. S. Eikle and W. J. Sharwood. *Eng. and Mining J.*, 1904, **77**, 1000.

The authors report on the occurrence of luminescent zinc blende in Mariposa county, California, Eureka county,

Nevada, and also in Colorado, Arizona, and Montana. The Mariposa ore has either a flaky or schistose structure, and ranges in colour from a light to a dark grey. It consists mainly of a granular mixture of white barite (barium sulphate) and brown sphalerite (zinc blende), the latter being the luminescent constituent. The ore also contains tetrahedrite and galena, and about 17 dols. of gold and 4 oz. of silver per ton. When the ore is scratched with a knife-blade (or even with the finger-nail), a bright line of light follows the point of the blade. The appearance is that of a series of momentary sparks, which are plainly perceptible in daylight. The ore is not radio active. —A. S.

Vanillin and Morphine; Action of an indirect Oxidising Ferment [Anaeroxydase] on —. E. Bourquelot and L. Marchadier. *J. Pharm. Chim.*, 1904, 20, 5—10.

It is found that the indirect oxidising ferments [anaeroxydases], such as are found in an infusion of oatmeal, react on vanillin and morphine, in the presence of hydrogen peroxide, precisely like the direct oxidising ferments or oxydases, forming dehydrodivanillin in the first case, and oxymorphine in the second. The action is quite independent of any decomposition of the hydrogen peroxide; if manganese dioxide be employed as the decomposing agent, the oxidisable body undergoes no modification, which demonstrates that the so-called "nascent" oxygen plays no part in the reaction. It appears that the oxygen given off under the action of anaeroxydases, is, at any rate partially, in a different molecular state at the time of its generation, to that formed by the action of manganese dioxide.

Oxydases and anaeroxydases have several properties in common which show that their functions are closely related. Thus the presence of a relatively high percentage of alcohol, even up to 50 per cent., does not hinder the action of either. Traces of hydrocyanic acid are sufficient to arrest their activity, and both ferments are much more resistant to heat than hydrolysing ferments. Bourquelot has advanced the theory that true oxidising ferments may be a special form of ozonides (in fact, peroxides), which, after having parted with their available oxygen to oxidisable bodies, absorb it again from the air and thus act as carriers of oxygen. For the continuous decomposition of the regenerated ozonide, the intervention of an anaeroxydase is necessary. A direct oxydase would therefore appear to be a mixture of such an ozonide and an anaeroxydase. The fact that direct oxydases almost invariably act on hydrogen peroxide is thus explained. This hypothesis has recently been advanced, although somewhat differently, by Chodat and Bach [*Biochem. Centralblatt*, 1903, 1, 417]. See following abstracts. According to them, there are three classes of oxidising bodies, oxygenases (albuminoids which fix molecular oxygen forming peroxides); peroxydases, (indirect oxydases); and catalases (bodies which decompose hydrogen peroxide without themselves forming oxidation products). They therefore apply the term peroxydases, originated by Lioussier, to the anaeroxydases, on the ground that the denomination is more in conformity with the nomenclature generally accepted for the soluble ferments.

The word peroxydase would indicate a ferment acting on peroxides and oxidising them, which is absurd, since it reduces them; while oxygenase would mean a body acting on oxygen and oxidising it. Anticipating this anomaly, Bourquelot has chosen, almost a year prior to Lioussier, the terms "direct oxidising" and "indirect oxidising" ferments for these two groups, names which are self explanatory. As to the "catalases," since these are not agents of oxidation, they have no place in the category of the oxydases. —J. O. B.

IX. Peroxydase Reaction; Velocity of the —; Function of Peroxides in the Chemistry of Living Cells. A. Bach and R. Chodat. *Ber.*, 1904, 37, 2434—2440. (See also this J., 1902, 1561; 1903, 384, 887; 1904, 210, 505.)

The authors show that the velocity of the action of peroxydase follows the law of mass action, in so far as the reaction is not disturbed by the products formed. Per-

oxydase must be regarded as an enzyme, and differs in only one way from other enzymes: it becomes rapidly and completely used up in carrying out oxidation in presence of hydrogen peroxide, whilst other enzymes are more or less completely regenerated during their action, and are hence able to act on a relatively large quantity of material. This regeneration is, however, not a characteristic property of the enzymes, which are all more or less limited in their action. —T. H. P.

Oxido-reducing Enzyme; Existence and Conditions of Action of an — in Plants. J. E. Abelous. *Comptes rend.*, 1904, 138, 1612—1620.

The juice of the potato contains an enzyme which, like one present in the animal organism, energetically reduces nitrates, but which is incapable of oxidising salicylic aldehyde, except in presence of an oxidising agent, such as potassium chlorate; the latter then undergoes partial reduction. This difference in mode of action between the oxido-reducing enzyme of the animal organism and that of the vegetable organism, is due to the oxydases present in the latter, which oxidise the substance reduced by the former enzyme. When the plant cells are not ruptured and when air is excluded, so as to prevent the action of the oxydases, potato juice is able to oxidise salicylic aldehyde. —T. H. P.

Oxalates; Decomposition of — by Heat. Alex. Scott. *Chem. Soc. Proc.*, 1904, 20, 156.

In spite of the simple formulæ given to the oxalates, their decomposition by heat is by no means as simple as usually stated. Ordinary precipitated calcium oxalate turns grey on ignition, and this change, which is due to the separation of small quantities of carbon, occurs even with the purest calcium oxalate. This salt gives very little carbon dioxide and carbon, but always a little of each, decomposing practically in accordance with the equation usually given, $\text{CaC}_2\text{O}_4 = \text{CaCO}_3 + \text{CO}$. Sodium and barium oxalates decompose in accordance with the following equations: — $7\text{Na}_2\text{C}_2\text{O}_4 = 7\text{Na}_2\text{CO}_3 + 3\text{CO} + 2\text{CO}_2 + 2\text{C}$; $8\text{BaC}_2\text{O}_4 = 8\text{BaCO}_3 + 6\text{CO} + \text{CO}_2 + \text{C}$. Magnesium oxalate gives exactly equal volumes of carbon dioxide and monoxide and no carbon, $\text{MgC}_2\text{O}_4 = \text{MgO} + \text{CO} + \text{CO}_2$, but almost all the other oxalates tested gave notable quantities of carbon dioxide and carbon.

Butea Frondosa; Colouring Matter of the Flowers of —. A. G. Perkin. *Chem. Soc. Proc.*, 1904, 20, 169.

In a former communication (J. J. Hummel and A. G. Perkin, this J., 1903, 698), it was considered probable that butein from *Butea frondosa* exists in a colourless, as well as in a yellow form. These modifications are, however, distinct substances. The colourless compound now termed butin, $\text{C}_{15}\text{H}_{12}\text{O}_6$, crystallising from alcohol in colourless needles and from dilute alcohol in pale yellow needles with $\frac{1}{2}\text{H}_2\text{O}$, melts at $224^\circ\text{—}226^\circ$, whilst butein, $\text{C}_{15}\text{H}_{12}\text{O}_5$, orange-yellow needles (m. pt. $213^\circ\text{—}215^\circ$), crystallises from dilute alcohol with $\frac{1}{2}\text{H}_2\text{O}$. It is obtained in small quantity together with butin from the plant, and can be prepared from butin by the action of hot dilute caustic alkali or alcoholic potassium acetate. On fusion with alkali, butein gives the same decomposition products as butin, and on methylation the same two trimethyl ethers, (a) m. pt. $156^\circ\text{—}158^\circ$, and (b) m. pt. $119^\circ\text{—}121^\circ$. When digested with boiling dilute alcoholic sulphuric acid, butein is partially reconverted into butin, and by digesting the trimethyl compound (m. pt. $119^\circ\text{—}121^\circ$), which is really butin methyl ether, with alcoholic potash and water it passes into the butein methyl ether (a) (m. pt. $156^\circ\text{—}158^\circ$). Again on digesting butein methyl ether with alcoholic sulphuric acid butin methyl ether is obtained. Butein has the constitution of a tetrahydroxybenzylideneacetophenone (cbalkone), whilst butin is shown to have that of the corresponding flavanone compound (this J., 1904, 367).

New Books.

CALCULATIONS USED IN CANE-SUGAR FACTORIES. A Practical System of Chemical Control for Louisiana Sugar Houses and other Cane-producing Countries. By IRVING H. MORSE, B.S. First Edition. John Wiley and Sons, New York. 1904. Chapman and Hall, Ltd., London. Price 6s. 6d.

SMALL 8vo volume, containing preface and 75 pages of subject-matter, principally tables. The subjects treated of are mainly as follows:—I. Analysis of Products, with Tables. II. Extraction, Saturation, Inversion, &c.; III. Laboratory Records. IV. Tables. Solids, and Purity corresponding to each degree. Polarisation of Commercial Sugar, &c. V. Factors used in Calculating Available Sugar. Factors for Refinery Products. Beet-Sugar Factories and Factories Manufacturing 98° Sugar or "YC" Sugar. VI. The most Profitable Sugar to Manufacture, &c. VII. The Available Sugar in a Ton of Cane. "Yellow clarified," Second and Third. "98° Test," Second and Third. "Rendimiento" or Sugar Extraction for Cuban Factories.

DIE ELEKTROCHEMISCHE INDUSTRIE DEUTSCHLANDS. VON P. FROELAND, Ph.D. Wilhelm Knapp's Verlag, Halle-a-S. 1904. Price M. 2.50.

8vo volume, containing 64 pages of subject-matter, with four illustrations, and an alphabetical index. The subjects treated of are:—I. Origin, Aims and Limits of Electro-Chemical Industry in Germany. II. Production of Power for Electrochemical purposes in Germany. III. Alkali and Chlorine (Bromine). IV. Electric Bleaching. V. Hydrogen, Oxygen, and Ozone. VI. Calcium Carbide and Phosphorus. VII. Sodium, Magnesium, and Aluminium. VIII. Zinc. IX. Copper, Nickel. X. Noble Metals. XI. Other Inorganic Chemical Processes. XII. Organic Electro-Chemistry. XIII. Power required for Substances prepared electrolytically.

DIE ELEKTROCHEMISCHE REDUKTION DER NITRO-DERIVATIVER ORGANISCHER VERBINDUNGEN IN EXPERIMENTELLER UND THEORETISCHER BEZIEHUNG. VON JOH. MÖLLER. Wilhelm Knapp's Verlag, Halle-a-S. 1904. Price M. 4.

8vo volume, containing 113 pages of subject-matter and the alphabetical index of subjects and authors. This work is devoted to a description of all the experimental and theoretical results so far obtained in the reduction of the nitro-derivatives of organic compounds.

THE OCCURRENCE OF ALUMINIUM IN VEGETABLE PRODUCTS, ANIMAL PRODUCTS, AND NATURAL WATERS. By C. F. LANGWORTHY, Ph.D., and PETER T. AUSTEN, Ph.D. First Edition. John Wiley and Sons, New York. 1904. Price 8s. 6d. net. Chapman and Hall, London.

8vo volume, containing 132 pages of subject-matter and the alphabetical index. The subject treated of is classified as follows:—I. Aluminium in Vegetable Products. II. In Animal Products. III. In Natural Waters. IV. In Miscellaneous Materials. The work takes the form of a classified and complete bibliography of the subject.

ANALYTICAL CHEMISTRY. By F. P. TREADWELL, Ph.D., Professor of Analytical Chemistry in the Zürich Polytechnikum. Translated from the Second German Edition by WILLIAM T. HALL, S.B. Volume II.—Quantitative Analysis. John Wiley and Sons, New York. 1904. Price 17s. net. Chapman and Hall, Ltd.

8vo volume, containing prefaces, 645 pages of subject-matter, with 96 illustrations, and including numerous tables, and a set of logarithmic tables, followed by the alphabetical index. After the introduction with the usual descriptions of general methods of procedure, and of apparatus used, the work is divided into Parts I., II., and III., devoted as follows:—I. The Gravimetric Determination of the Metals and of the Metalloids. Part II. Volumetric Analysis—(A) Oxidation and Reduction Methods; (B) Precipitation Methods. Part III. Gas Analysis.

A SYSTEMATIC HANDBOOK OF VOLUMETRIC ANALYSIS, or the Quantitative Estimation of Chemical Substances by Measure, applied to Liquids, Solids, and Gases. Adapted to the Requirements of Pure Chemical Research, Pathological Chemistry, Pharmacy, Metallurgy, Manufacturing Chemistry, Photography, &c., and for the Valuation of Substances used in Commerce, Agriculture, and the Arts. By FRANCIS SUTTON, F.I.C. Ninth Edition, revised and enlarged. J. and A. Churchill, 7, Great Marlborough Street, London. 1904. Price 20s. net.

This volume, 8vo size, contains 607 pages of subject-matter, with 121 illustrations, and the alphabetical index. It is subdivided as follows:—Part I. Devoted to General Principles, gives Descriptions of the Chemical Balance, and General Apparatus and Methods. II. Alkalimetry. III. Analysis by Oxidation or Reduction. IV. Analysis by Precipitation. V. Application of Foregoing Principles of Analysis to Special Substances. VI. Special Applications of the Volumetric System to the Analysis of Urine, Potable Water, Sewage, &c. VII. Volumetric Analysis of Gases and Construction of Apparatus.

REPORT ON AIR TESTS IN HUMID COTTON WEAVING SHEDS. By FRANK SCUDDER, F.I.C. [Home Office.] Eyre and Spottiswoode, East Harding Street, Fleet Street, London, E.C.; 32, Abingdon Street, Westminster, S.W.; Oliver and Boyd, Edinburgh; and E. Ponsonby, 116, Grafton Street, Dublin. 1904. Price 3d.

This report refers to the question of ventilation of humid cotton cloth factories, in pursuance of an inquiry into the Cotton Cloth Factories Act, 1889, commenced in 1896, when the Secretary of State appointed a Departmental Committee of which Sir Henry Roscoe, F.R.S., was chairman. On Feb. 2, 1893, it was ordered that ventilation should be such that the carbon dioxide in the air of such factories should not exceed nine volumes per 10,000 of air. The report states that "in the great majority of cases the proportion of carbon dioxide was far below" the limited quantity mentioned. The method of determination and apparatus employed Mr. Scudder describes. The method used was that of Pettenkofer with baryta water and oxalic acid.

Trade Report.

I.—GENERAL.

INTERNATIONAL EXHIBITION, SAINT LOUIS, 1904. Dept. C., Liberal Arts. Catalogue of British Exhibits, Classified under Group 23. Chemical and Pharmaceutical Arts. Issued by the Royal Commission. William Clowes and Sons, Ltd., Duke Street, Stamford Street, S.E., and Great Windmill Street, W., London. 1904. Price 1s. net.

SUB-COMMITTEE FOR GROUP 23 (Chemical and Pharmaceutical Arts), Dr. Boverton Redwood, F.R.S.E., *Chairman*, A. Gordon Salamon, Esq., Thomas Tyrer, Esq., Charles Wightman, Esq., Edmund H. Lloyd, *Secretary*.

This catalogue of the British exhibits in Group 23 contains an introductory note of nine pages, a plan of the exhibits, a list of the exhibitors arranged in alphabetical order, with references to the plan and to the pages in the catalogue, a series of descriptive accounts of some of the principal branches of the industry represented by the exhibits (pages 11—137), and a detailed list of exhibitors and exhibits (pages 138—180).

In the introductory note it is stated that arrangements were made with Mr. G. R. Dunell to obtain information by means of interviews with leading exhibitors and technologists in Great Britain, and that the particulars so furnished have, with the assistance of Mr. Walter F. Reid, Chairman of the London Section of the Society of Chemical Industry, been embodied in the descriptive accounts already mentioned.

EXHIBITS OF SPECIAL SCIENTIFIC INTEREST.

LOW TEMPERATURE RESEARCH EXHIBIT.—Complete plant in operation, as employed by Prof. Sir James Dewar, F.R.S., at the Royal Institution, London, in producing liquid and solid hydrogen. (Constructed for the Royal Commission by Messrs. Lennox, Benton, and Reynolds, Ltd.) *Scientific Lectures and Demonstrations* in connection with this exhibit will be given by Mr. J. E. Petavel.

WELLCOME CHEMICAL RESEARCH LABORATORIES; WELLCOME PHYSIOLOGICAL RESEARCH LABORATORIES.—Specimens of essential oils, substances isolated from chaumugra seeds, chaumugric acid derivatives, alkaloids, extracts, morphine derivatives, phenylic salts of dibasic acids, and certain inorganic salts, &c.

RALY, E. C. C.—Photographs of spectra.

COLLIE, Prof. J. NORMAN, Ph.D., F.R.S.—Specimens of dimethylpyrone, and some derivatives, also of oxonium compounds.

GLASGOW AND WEST OF SCOTLAND TECHNICAL COLLEGE (Prof. G. G. Henderson, M.A., D.Sc.)—Specimens illustrative of research work.

HARTLEY, Prof. W. H., F.R.S., Royal College of Science for Ireland, Dublin.—Photographs and substances recently prepared for research purposes.

LISTER INSTITUTE OF PREVENTIVE MEDICINE (Dr. Allan Macfadyen and Mr. Sydney Rowland).—Diagrammatic section and photographs of the disintegrator used in investigations on intracellular toxins.

LOVIBOND, JOSEPH W.—“Tintometer” and sets of equivalent colour standards, &c.

NEWLANDS, B. E. R.—Collection of 11 ancient bronze or bell metal mortars. Photographs, by Miss M. A. Newlands, of old prints.

THE OWENS COLLEGE (Prof. H. B. Dixon, M.A., F.R.S.).—Exhibits illustrating the discoveries of Sir H. E. Roscoe, F.R.S., and the late Prof. C. Schorlemmer, F.R.S.; the late Dr. E. Schunck, F.R.S.; the late R. S. Dale and Prof. C. Schorlemmer; the late Sir Edw. Frankland, F.R.S.; and Prof. H. B. Dixon, F.R.S.

RAMSAY, Prof. Sir Wm., F.R.S.—Vacuum tubes containing helium, neon, argon, krypton, and xenon (Ramsay and Travers).

REYNOLDS, Prof. J. EMERSON, F.R.S.—Specimens illustrative of research work at Trinity College, Dublin.

ROYAL COLLEGE OF SCIENCE, LONDON (Prof. W. A. Tilden, F.R.S.).—Specimens illustrative of research work by staff and students.

SOCIETY OF APOTHECARIES OF LONDON (Wm. Chattaway).—Antiquities relating to pharmacy.

TRAVERS, Prof. MORRIS W., F.R.S.—Diagram of hydrogen liquefier.

The names of the firms who take part in the British Exhibit are given below under the respective branches of Chemical Industry and Pharmacy:—

Alkali Industry:

Alkali.—Brunner, Mond and Co., Ltd.; Castner-Kellner Alkali Co., Ltd.; Chance and Hunt, Ltd.; J. Crosfield and Sons, Ltd.; United Alkali Co., Ltd.

Sulphuric Acid.—F. W. Berk and Co., Ltd.; W. Pearce and Sons, Ltd.; Spencer, Chapman and Messel, Limited.

Nitric Acid.—F. W. Berk and Co., Ltd.; Alfred White and Sons.

Alum.—R. and J. Garroway; Peter Spence and Sons, Ltd.

Brimstone.—Albright and Wilson, Ltd.; The Anglo-Sicilian Sulphur Co., Ltd.; A. Boake, Roberts and Co., Ltd.; Chance and Hunt, Ltd.; J. M. Collett and Co.; The Gas Light and Coke Co.; F. C. Hills and Co.; F. Kendall and Son, Ltd.; W. Pearce and Sons, Ltd.; United Alkali Co., Ltd.

Coal Tar Products.—J. B. Aitken; Brooke, Simpson and Spiller, Ltd.; The Gas Light and Coke Co.; Levinstein, Ltd.; Read Holliday and Son, Ltd.; The South Metropolitan Gas Co.; Stone and Tinson.

Cyanides and Prussiates.—The British Cyanide Co., Ltd.; The Cassel Gold Extracting Co., Ltd.; The Castner-Kellner Alkali Co., Ltd.; The Gas Light and Coke Co.; Swan and Kendall; The United Alkali Co., Ltd.

Electro-Chemistry.—The Castner-Kellner Alkali Co., Ltd.; The United Alkali Co., Ltd.

Explosives.—Nobel's Explosive Co., Ltd.; Jas. Pain and Sons.

Nickel.—Specimens illustrating the Mond Nickel Carbonyl Process; The Mond Nickel Co., Ltd.

Oils, Fats, Waxes, Soap, and Candles:

Mineral Oils.—Assam Oil Co., Ltd.; Burmah Oil Co., Ltd.; Joseph Crosfield and Sons, Ltd.; Evans, Sons, Lescher and Webb, Ltd.; J. C. and J. Field, Ltd.; Price's Patent Candle Co., Ltd.

Apparatus.—Baird and Tatlock, London, Ltd.; W. J. Fraser and Co.; John J. Griffin and Sons, Ltd.; Joseph W. Lovibond; Townson and Mercer.

Soap Manufacture.—Edward Cook and Co., Ltd.; Joseph Crosfield and Sons, Ltd.; Evans, Sons, Lescher and Webb, Ltd.; J. C. and J. Field, Ltd.; Price's Patent Candle Co., Ltd.; Sharon Chemical Co., Ltd.; United Alkali Co., Ltd.

Candle Industry.—Assam Oil Co., Ltd.; Burmah Oil Co., Ltd.; J. C. and J. Field, Ltd.; Price's Patent Candle Co., Ltd.

Ethereal Oils.—Allen and Sons, Ltd., Stafford; Burroughs, Wellcome and Co.; Evans, Sons, Lescher and Webb, Ltd.; T. Morson and Son.

Pharmacy, Chemistry and Pharmaceutical Apparatus, Antiquities relating to Pharmacy.—Albright and Wilson, Ltd.; Allen and Hanburys, Ltd.; Allen and Sons, Ltd., Stafford; John Austen; Baird and Tatlock (London), Ltd.; Battley and Watts; A. Boake, Roberts and Co., Ltd.; The Bone Phosphate and Chemical Co., Ltd.; Burroughs, Wellcome and Co.; J. M. Collett and Co.; Corbyn, Stacey and Co., Ltd.; Daniel Davison; Doulton and Co., Ltd.; Elliman, Sons and Co.; Evans, Sons, Lescher and Webb, Ltd.; W. H. Francis; John J. Griffin and Sons, Ltd.; Hemingway and Co.; Hopkin and Williams, Ltd.; Howards and Sons, Ltd.; Jeyes' Sanitary Compounds Co., Ltd.; Kemball, Bishop and Co., Ltd.; F. Kendall and Sons, Ltd.; John Bennet Lawes and Co., Ltd.; Joseph W. Lovibond; Wm. Martindale; McDougall Bros.; May and Baker, Ltd.; Morris, Little and Sons, Ltd.; T. Morson and Son; B. E. R. Newlands; Newton, Chambers and Co., Ltd.; Parkin, Ness and Co.; The Society of Apothecaries of London; John and E. Sturge; Townson and Mercer; Thomas Tyrer and Co., Ltd.; United Alkali Co., Ltd.; Wm. Warren; Alfred White and Sons.

Pigments and Paints.—Lewis Berger and Sons, Ltd.; Walter Carson and Sons; The Gas Light and Coke Company; Hemingway and Co. and Hemingway's; London Purple Co., Ltd.; May and Baker, Ltd.; The Sharon Chemical Co., Ltd.; Thomas Tyrer and Co., Ltd.; Wood and Bedford.

Power Gas.—Model of Mond's Patent Gas-producer Plant, with ammonia recovery apparatus. Dr. Ludwig Mond, F.R.S.

FRANCO-GERMAN TARIFF AND TRADE RELATIONS.

U.S. Cons. Repts., No. 1984, June 21, 1904.

A committee appointed by the Parliament of France to investigate the tariff and trade relations of France with some of the great nations of the world as affected by the new arrangements entered into or to be negotiated since the end of the treaties which expired December 31, 1903, has just made a voluminous report, of which the following is an extract:—

The report of the commission begins by a short review of the industrial and agricultural condition of Germany. The

following are the figures of production for the past three years:—

Description.	1899-1900.	1900 1901.	1901-2.
	Tons.	Tons.	Tons.
Wheat.....	3,947,447	3,941,465	2,498,851
Rye.....	8,675,702	8,550,659	8,162,690
Barley.....	2,988,876	3,002,182	3,221,102
Oats.....	6,982,687	7,071,930	7,050,153
Potatoes.....	38,486,202	40,585,317	48,697,261
Hay.....	25,009,781	23,767,700	22,370,047

The large crop of potatoes was stimulated by the growth of the output of alcohol, which, in Germany, is generally derived from potatoes. The exports of alcohol from Germany are constantly increasing, and the consumption of alcohol for varnish, chemical products, lighting, heat, and power is very great.

The beet crop alone has increased in France during the last 10 years. It passed from 47,500 acres to 837,400 acres, an increase due to the sugar laws of 1884 and 1897 establishing the export bounty. As those laws are repealed to-day this acreage is likely to diminish. It will be very difficult to find a compensation in the increase in the consumption of alcohol in industry.

The commission here enters upon an elaborate review of the mineral wealth of Germany, comparing the output of iron, potassium, zinc, lead, salt, lignites, copper, and coal for the past six years. The concluding sentence is that the growth in the mining industry in Germany can only be compared to that of the United States.

Following this is a tabulated statement of the iron and steel industry of the United States, Great Britain, Germany, France, Russia, and Spain, in the order given, the conclusion again being that the progress of Germany in that industry is only comparable with the United States.

The report states that Germany wages a very sharp competition against French chemical products—above all, pure products for the laboratory. In that branch the Germans have almost monopolised the commerce of the world, thanks to the exceedingly well-equipped mills and to their activity. They have also succeeded in materially reducing the first cost of production. In Germany, 1,950,000 cb m. (70,816,200 cb. ft.) of wood were turned into paper in 1897. Germany consumes annually 750,000 tons of paper and cards. This immense consumption is due to the activity of printing and lithography in that country.

The report enters into a careful examination of the commercial conditions existing between France and Germany, giving the text of the treaties, and then gives the new customs laws of Germany, from which the following are taken:—

Lubricating oils are charged a duty of 12.50 francs (2.412 dols.) per 100 kilos. (220 lb.) by the new German tariff. Stearin, which was formerly free of duty, is now dutiable at 12.50 francs (2.412 dols.) per 100 kilos.; candles are 28.15 francs (5.433 dols.) per 100 kilos. The duty on the same articles coming into France are but 8 and 16 francs (1.544 dols. and 3.038 dols.) respectively. Soaps are charged with a duty of from 6.75 to 12.50 francs (1.302 dols. to 2.412 dols.). France formerly exported 1,500,000 francs* (289,500 dols.) worth of soap and perfumery into Germany. It is thought that this business will be lost under the new tariff.

Germany's exports of aniline and similar products increased from 52,000,000 marks (12,376,000 dols.) in 1892 to 81,345,000 marks (19,860,110 dols.) in 1901.

France imported chemical products from Germany in 1900 representing a value of 22,700,000 francs (4,381,100 dols.); in 1901, a value of 21,501,000 francs (4,149,693 dols.); and in 1902, a value of 21,618,000 francs (4,172,274 dols.).

In the new German tariff sulphuric, nitric, hydrochloric, boric, and other acids are free of duty; but oxalic acid is protected by a duty per 100 kilos. of 10 francs (1.93 dols.); acetic acid, 15 francs (2.895 dols.); and tartaric acid, 10 francs (1.93 dols.).

In following the example of France, Germany has found it necessary to protect soda salts by a high duty; caustic

soda, 4.37 francs (84.3 cents); sodium carbonate, 1.87 francs (36 cents). The duty on alum and aluminium sulphate is 3.75 francs (72.3 cents).

Aniline colours are exempt, which is very natural, as Germany possesses all the markets.

Varnish, lacquers, and mastics are placed at greatly increased duties—37.50 francs (7.237 dols.) for alcohol varnish.

In short, for secondary chemical products a heavy protective duty has been imposed—6.75 francs (1.286 dols.); for gelatin in leaves, 37.50 francs (7.237 dols.). Casein has a protection of 12.50 francs (2.412 dols.), while as paste it has no duty at the French frontier.

DRAWBACKS IN THE UNITED STATES OF AMERICA.

Foreign Office Annual Series, No. 3185, June 1904.

Although the United States tariff is strongly protective, a drawback of 99 per cent. of the duties paid on imported articles is allowed when they are used in the manufacture of other articles in the United States which are subsequently exported. This applies to the tin plate trade. Large quantities of British tin plates are imported, and on being made up in America into cases, are filled with American oils, canned goods, &c., and on exportation 99 per cent. of the duty paid is refunded as a drawback. This drawback affects a large number of articles other than tin plates. The law will be found in the Act of July 24, 1897, which has been recently published in the Parliamentary Paper, Commercial No. 2 (1904).

CHEMICAL EXPORTS FROM GERMANY.

Foreign Office Annual Series, No. 3196, June 1904.

A large firm manufacturing fine chemicals reports that, though demand was active in 1903, prices were almost unremunerative by reason of fresh competition at home and abroad. Foreign countries are endeavouring ever more vigorously to emancipate themselves altogether from German products, and with much success. The United States, especially under protection of its tariff, is rapidly and successfully developing the manufacture of fine chemicals, so that the export from Germany to America can now be effected only with great difficulty. The firm adds that exports to Canada have been made impossible by the differential duty in favour of the United Kingdom.

III.—TAR PRODUCTS, PETROLEUM, Etc.

PETROLEUM IN CALIFORNIA IN 1903.

Foreign Office Annual Series, No. 3185, June 1904.

The output of oil in California amounted to 20,000,000 barrels* in 1903, as against 13,000,000 barrels in 1902. Deducting that which will be either refined or exported, the balance available for steam purposes will be large enough to disturb the coal market. The price of oil has decreased during the past year, and the railway companies have bought up large oil properties. The older wells—especially in South California—are giving out, and the greatest caution as to oil properties offered for sale should be exercised. The Standard Oil Co. purchased 9,000,000 barrels from the Peerless Oil Co., at 20 c. a barrel at the wells, and engage to purchase 5,000 barrels daily for five years as from Jan. 1, 1903. This is held to prove that the Standard Oil Co. are convinced that the attempts to refine crude Californian oils have succeeded. In fact, they are being refined locally with very good results, but are not of a high grade, and are mixed with fine Eastern oil. The use of oil fuel is extending in every direction.

PETROLEUM PRODUCTION OF RUSSIA.

Bd. of Trade J., July 7, 1904.

The production of naphtha wells in the peninsula of Apcheron in 1903 was 595,000,000 pounds,* as compared with 637,000,000 pounds in 1902, and 675,000,000 pounds in 1901. The decrease in 1903 is due to the fact that, owing

* 1 barrel = 33.5 galls.; 1 pound = 36.112 lb.

to the low market price of petroleum, several of the more important wells were not worked during the earlier part of the year; there was also a diminution in the output of some of the other wells. Moreover, work was severely hampered by labour disputes during the month of July. Some of the wells are giving signs of exhaustion, but on the other hand, new sources of production have been discovered in the district of Bibi-Eibat.

In 1903, 80,000,000 pounds of naphtha were exported from Batoum, showing an increase of 8 per cent. on 1902. Of this, 61,000,000 pounds were petroleum properly so-called. 27,000,000 pounds were sent to the East, the remainder to Europe.

IV.—COLOURING MATTERS AND DYE STUFFS.

DYE STUFFS: U.S. CUSTOMS DECISIONS.

June 1904.

Pyrol Black R.O., Sulphur Black T.G., and Salphaniline Black were decided to be dutiable at 30 per cent. *ad val.* as "coal tar dyes," under par. 15 of the tariff.

—R. W. M.

X.—METALLURGY.

ZINC ORE EXPORTS FROM CARTHAGENA, SPAIN.

Foreign Office Annual Series, No. 3188, June 1904.

In his report for 1903, the British Vice-Consul at Carthage gives the following figures showing the shipments of zinc ore from that port to the countries named during the past year:—

	Tons.
United Kingdom	4,150
Belgium	82,050
Germany	1,050
France	1,000
Total	88,250

The above total shows an increase of 22,580 tons over the preceding year. The United Kingdom has taken more by 893 tons, Belgium by 21,427 tons, Germany by 900 tons, and France by the full shipment of 1,000 tons. Of the above quantity 7,900 tons were calamine, the remainder being blende, usually found in the mines which are worked for lead, and, not unfrequently, the lead ore gives out and "degenerates," as the miners say, into blende.

IRON INDUSTRY OF THE TRANSVAAL.

Bd. of Trade J., July 7, 1904.

The *Rhodesia Herald* states that the first blast-furnace in South Africa has recently been erected near Pretoria, on the line of the railway; it is situated in the centre of iron deposits and close to coal supplies. The furnace, which will have a weekly capacity of 500 tons of pig-iron, is to be followed by rolling-mills and a steel-converting plant. In addition to iron ore and coal, there is plenty of limestone in the neighbourhood. The ore is of the hematite and magnetite variety, and runs 58 to 62 per cent. of metallic iron. A survey above ground and cross-cutting indicate that there are some 62,000,000 tons of iron in sight. There is also manganese ore in Africa.

MINERAL OUTPUT OF WESTERN AUSTRALIA.

Government Gazette of Western Australia, April 8, 1904.

	1902.		1903.	
	Quantity.	Value.	Quantity.	Value.
	Tons.	£	Tons.	£
Black tin	620	39,783	617	55,890
Copper ore	2,262	5,090	20,686	56,541
Ironstone	4,890	2,040	220	81
Coal	140,864	856,188	133,427	69,128
Limestone	5,080	1,340	1,280	178

ARSENIC IN SPAIN.

Chem. and Druggist, July 2, 1904.

A company has been formed to develop deposits of arsenical pyrites situated in the province of Orense, Spain. The ore carries some gold and from 25 to 40 per cent. of arsenious acid. It is proposed to treat the pyrites by cyanidation for the recovery of the gold, and the residue will then be used for the production of arsenic. A number of concessions have been granted recently in the same locality for similar undertakings.

XII.—FATS, FATTY OILS, Etc.

CASTOR OIL PRODUCTION IN NEW ZEALAND.

Queensland Agric. J. Pharm. J., July 9, 1904.

The castor oil plant (*Ricinus communis*) is a native of all warm countries. It is very hardy and will thrive on almost any soil and in any situation, attaining a great height in one season after sowing the seed. The plant prefers dry soils. The seed should be sown in rows, 6 ft. apart and 4 ft. in the rows. Before sowing, the seed should be steeped in hot water for 24 hours. After the plants are above ground, the cultivation is the same as for corn, cotton, or tobacco.

When the seed-pods are ripe, they suddenly burst open and scatter the seeds in all directions. Special arrangements must, therefore, be made for harvesting them. When the pods are seen to be turning brown, the spikes which bear them are cut off and taken to a clean-swept piece of hard ground which may be enclosed with galvanised iron. Here they remain, being turned occasionally until the pods have emptied themselves. The husks are then removed by winnowing, and the beans swept up and bagged. They must on no account be allowed to get wet. This work is so light that it can be done by young children.

The yield of beans varies between 20 and 30 bushels per acre. The oil is extracted by means of a hydraulic, a screw, or a lever press. What is known as "cold-drawn castor oil" is that obtained by mere pressure. The first thing to do is to remove the external hull. This is effected by passing the beans through two revolving rollers, set in such a way as merely to crack the hull, which is then got rid of by winnowing. The decorticated seeds are then put into coarse hempen bags about 2 ft. in diameter. Between each layer of bags there is placed a steel plate, and about 20 or 30 bags, each holding about 40 lb. of seeds, are placed on top of each other in the press. The pressure must be applied gradually, and the oil running from the first press is the best. As the pressure is increased up to the full power of the press a second quality is produced. The pulp after this is taken out, mixed with hot water, and again pressed to obtain the third quality. Another method is to place the beans in a stone roller mill. This consists of two large round stones connected by a spindle, which are revolved by horse-power in a hollow round stone, in which the beans are placed. These stone mills hold about 2 cwt., and this quantity is crushed every half-hour. The oil is poured into filtering bags, and the pure oil runs from the shelves on which the bags are placed through tubes into vessels placed to receive it. The average yield of oil is 40 per cent.

FINISHING SOAP: U.S. CUSTOMS DECISION.

June 16 and 18, 1904.

Several varieties of soap known as finishing soap, consisting in one case of beef tallow and alkali, assessed for duty as "alizarin assistant not made from castor oil," at 30 per cent. *ad val.* under par. 32 of the tariff; in another case assessed for duty as "alizarin assistant containing less than 50 per cent. of castor oil," at 15 cents per gallon; and in a third case, consisting of resin and alkali, assessed for duty at the same rate—none of the above having been sulphonated—were decided to be dutiable at 20 per cent. *ad val.* under par. 72 of the tariff, as "soaps not specially provided for."—R. W. M.

SOAP STOCK: U.S. CUSTOMS DECISION.

June 21, 1904.

A mixture of oils consisting of castor oil, 77.50 per cent.; olive oil, 12.72 per cent.; and oleic acid, 9.78 per cent., and intended for use in manufacturing, was held to be dutiable according to the component material of chief value under section 7 and par. 83 as "castor oil" at 35 cents per gallon. Although the article was suitable for use in soap making, its common and exclusive use for this purpose was not shown with sufficient conclusiveness to entitle it to free entry under par. 568 as "soap stock." The Board also held that oleic acid is not a distilled, essential, expressed, or rendered oil; hence the above mixture is not covered by par. 3, which provides for combinations of the foregoing

—R. W. M.

XIII. A.—PIGMENTS, PAINTS, Etc.

OCHRE SHIPMENTS FROM CARTHAGENA.

Foreign Office Annual Series, No. 3188, June 1904.

As regards ochre, the Vice-Consul states that only 843 tons were shipped, all to the United Kingdom. Buyers are difficult to please, good ochre is difficult to get, and profits are not good enough to animate shippers in making special efforts to increase quantities.

MARKING INK; MANUFACTURE OF — IN MEXICO.

Bd. of Trade J., July 14, 1904.

According to a despatch from the Italian Minister at Mexico, reproduced in the *Bollettino Ufficiale del Ministero d'Agricoltura*, a large quantity of marking ink of the best quality is now being manufactured at Jalapa, in the state of Vera Cruz. This ink is extracted from the pulp of the *Eselelahnitl* tree. During the month of April, about 2,300 litres were exported to Germany.

The tree from which the ink is manufactured is found in great abundance throughout the districts of Jalapa, Vinos, Texcoco, and Huaxtlan; it is therefore confidently expected that the new industry will be greatly developed.

XIII. B.—RESINS, VARNISHES, Etc.

RUBY VARNISH: U.S. CUSTOMS DECISION.

June 10, 1904.

A varnish tinted red for photographic purposes was held to be properly assessed for duty as "varnish" at 35 per cent. *ad val.* under par. 53 of the Tariff Act, and not to be dutiable either at 25 per cent. *ad val.* as a chemical compound under par. 3, or at 20 per cent. *ad val.* under section 6, as a "manufactured article unenumerated." The Board further held that the assessment of duty at 1.35 dols. per gallon and 35 per cent. *ad val.*, as "spirit varnish," was erroneous, as the article contains no ethyl alcohol.

—R. W. M.

XIII. C.—INDIA-RUBBER, Etc.

INDIA-RUBBER CULTIVATION IN GERMAN COLONIES.

Foreign Office Annual Series, No. 3186 June 1904.

Much attention has been given of late in Germany to the necessity of improving the existing condition of india-rubber cultivation in German African colonies, where the same has not developed as it was hoped, and in some of the colonies the production has in fact been diminishing. Those producing most india-rubber at present are Cameroon and East Africa, but the exportation of both together did not exceed 130,000 l. in value in 1902.

XVI.—SUGAR, STARCH, Etc.

SCHOOL IN CONNECTION WITH THE SUGAR, STARCH, AND ALCOHOL INDUSTRIES IN ITALY.

Bd. of Trade J., July 1, 1904.

H.M. Consul-General at Florence reports that, in August next, a school will be opened, attached to the

University of Ferrara, in connection with the sugar, starch, and alcohol industries.

The teaching will include Technical Chemistry, Technical Mechanics, Seed Selection and Technical Agriculture, Zymotechnics, Legal Matters and Accounts, and Chemical and Industrial Analyses.

GUMS IN ABYSSINIA.

Bd. of Trade J., June 30, 1904.

Abyssinian gums in general are white and highly esteemed. They are abundant and receive but little commercial attention. The best regions are those of from 4,900 to 5,900 ft. altitude, although in the lower plains there is quite sufficient to invite exploitation. All these gums are exported by way of Aden, and are probably never recognised at the ports of arrival as of Abyssinian origin. The export at present amounts to about 1,930 l. annually. This export could be easily augmented to five times the present amount.

XVII.—BREWING, WINES, SPIRITS, Etc.

INTERNATIONAL SPIRIT INDUSTRY EXHIBITION, VIENNA.

Chem.-Zeit., 1904, 28, 477—478.

Cooking Apparatus.—The experiments made with various types of cooking apparatus fed with spirit show that whilst the older forms required 13 minutes to boil 1 litre of water and consumed 38 grms. of spirit, the newer types do the same in nine minutes with 32 grms, and the regulator stoves in eight minutes with 27 grms. The quantity of spirit consumed per hour in the three kinds is 175, 210, and 200 grms. respectively.

Lamps.—The exhibits comprise incandescence spirit lamps up to 1,000 Hefner candle-power. Tests of some of them, under the auspices of the Ministry of Commerce, gave the following results, 90 per cent. spirit being used:—

Lamp.	Candle Power.	Time Needed for Heating Burner.	Consumption per 10-Candle Hour.
		Min.	Grms.
Incandescence lamp with by-pass flame	42.5	1.5	24
Incandescence lamp with heat conductor	34.0	2.0	29
Street spirit lamp	70.0	9.5	12
Petroleum lamp with 16-line circular burner	9.5	..	43

Motors and Automobiles.—The exhibits are considered to demonstrate the suitability of spirit for power purposes, and the competition with petrol resolves itself into the question of relative cost. The fixed motors are fed with unmixed motor spirit, carburetted spirit being used for automobiles.

Denaturing.—A portion of the spirit was denatured with a preparation prescribed by the Royal Austrian Agricultural Experimental Station [composition not given], the remainder being mixed to furnish motor spirit.—C. S.

METHYLATION: RECTIFYING AND COMPOUNDING.

Pharm. J., July 9, 1904.

In the House of Commons, on July 5, the Chancellor of the Exchequer said that the total quantity of spirits distilled in England during the year ended March 31, 1904, was 11,694,831 proof gallons. The quantity of home-made spirits used for methylation during the same period was 4,398,002 proof gallons. He had no means of knowing the quantities used for rectifying and compounding. 33,300 proof gallons of British spirits were despatched to Customs warehouses at Leith from English distilleries during the 12 months ended June 30, 1904. The materials commonly used in the distillation of English spirit were malt, unmalted grain, molasses, sugar, glucose, and rice.

TAX-FREE SPIRIT.

Times, July 21, 1904.

In committee on the Finance Bill, on July 20, Mr. Scott-Montagu moved a new clause providing that alcohol which had been suitably denatured and rendered unpotable and was required for motive power, lighting, heating, and manufacturing purposes should be sold without payment of any duty or tax, and that absolute alcohol should also be exempt from duty when employed in manufacturing operations where it could be proved to the Commissioners that denaturing agents would prevent its use. He also asked that a committee should be appointed to investigate the subject.

The Chancellor of the Exchequer said that he could not accept the clause as it stood on the paper, but he would accept the suggestion to have a committee appointed to look into the matter. He was aware that a great deal of importance was attached to the question, and he agreed that the public should have an opportunity of explaining what it was they wanted as well as an opportunity of learning the facilities which the law provided. He could not undertake to deal with a point of legislation in the Finance Bill.

Mr. Bryce asked whether alcohol for motive power would be the only question inquired into by the committee, or whether the inquiry would be extended to the exemption of alcohol for use in various trades.

The Chancellor of the Exchequer: I intended the committee to cover both subjects.

Mr. Gibson Bowles warned the right hon. gentleman against agreeing too readily to these exemptions of alcohol. Exemption of one man meant an increased burden on another. The committee might disclose grievances, of course, but the right hon. gentleman should not be led away to propose in his next Budget anything in the interest of the motor industries or any other industries. He did not agree with the proposal that spirits which were not drunk should be exempt any more than spirits that were drunk.

The clause was withdrawn.

SPIRIT IN POLAND.

Chem. and Druggist, July 16, 1904.

The failure of the potato crop in Poland last year proved disastrous for the spirit distilleries, and large quantities of maize had to be imported from Bessarabia and the Caucasus to replace potatoes. The prices paid by the monopoly for spirit in 1903 were from 55 to 71 copecks per vedro (average 6d. per gallon), which was higher than usual. According to the law of 1903, permission was granted for the use of denatured spirit free of Excise for industrial and technical purposes; but little advantage was taken of it on account of the shortness of spirit and the low price paid by the monopoly (4d. per gallon) for spirit to be denatured, which did not encourage distillers to sell spirit to the monopoly for that purpose. Denatured spirit was sold by the monopoly only at Warsaw at 6d. per gallon. The consumption of denatured spirit was small, as special permission to use it has to be obtained from the Ministry in each case, even for a single lamp. According to the Law of June 12, 1900, which was in force till the end of 1903, Poland was allowed to produce 22,500,000 galls. of spirit a year; but a new law, which came into force in January 1904, does not now in any way restrict the production of spirit in Poland. The annual requirements of the monopoly have been fixed by the Ministry at 18,191,355 galls. for the period 1903-7, the monopoly taking this quantity at a fixed rate.

SPIRITUOUS TINCTURES IN CAPE COLONY.

Pharm. J., June 18, 1904.

On and after July 1, 1904, a duty of 15s. per proof gallon will be levied on spirituous tincture imported into Cape Colony. Tinctures made in the Colony will only pay a duty of 6s. The duty affects British manufacturers very seriously, and the matter is under consideration by the London Chamber of Commerce.

XVIII. B.—SANITATION.

NITROUS FUMES AND ARSENIURETTED HYDROGEN.

Chem. Tr. J., July 9, 1904.

The annual report of the Prussian factory inspectors gives particulars concerning the 1,293 chemical factories which were visited, special attention being paid to accidents and dangers incidental to chemical manufactures. Mention is made of several cases of poisoning by nitrous fumes; in some instances the workmen appeared to recover from the effects, but were subsequently seized with internal pains and died. Arseniuretted hydrogen was the cause of two deaths in another instance. The particularly deadly nature of this gas is not sufficiently realised. It is very liable to be present in hydrogen generated from zinc or iron, and may be formed from arsenic contained either in the acid or the metal. Very minute quantities are sufficient to kill a man. Wherever hydrogen is used, either for lead burning or for reducing purposes, or for filling balloons, this danger should not be lost sight of. Several explosions took place in explosive factories during 1903.

CHLOROFORM AS A REMEDY FOR THE INJURIOUS EFFECTS OF INHALING NITROUS FUMES.

Chem. Ind., 1904, 27, 379.

Chloroform has been found an excellent remedy for the ill effects of "gassing" with nitrous fumes. In many cases, after apparent entire recovery, workpeople and others are seized with cramps or spasms and die. The directors of the Rheinisch-Westfälischen Explosives Company, Troisdorf, have issued an instruction in their works that any person who has inhaled nitrous fumes must have administered to him every 10 minutes a glass of water into which 3 to 5 drops of chloroform have been added from a dropping-tube until recovery. The largest quantity of chloroform that may be thus administered per day is 1.5 grm.; 3 drops of chloroform are considered as weighing 0.045 grm., and 5 drops 0.078 grm. This prescription is to be strictly observed, and the amounts by no means exceeded. Chloroform being somewhat unstable when exposed to light, it must be kept in bottles of coloured glass.

XX.—FINE CHEMICALS, Etc.

CASCARA SAGRADA, OR CHITTIM BARK, IN OREGON.

Foreign Office Annual Series, No. 3207, July 1904.

The bark of the cascara sagrada, or chittim tree, has of recent years assumed a growing importance as an article of commerce, and appears to be produced principally in this district. The article is being largely used in medicine, and during the past year about 500 tons were shipped to the United Kingdom and Continent. The production was stimulated by high prices to such an extent that there is danger of all the trees being destroyed. In May the average price paid was 2d. per lb., but under demand it reached 6d. in August, and as much as 10d. was paid in September. The peeling season is from May to August. The tree grows in wet ground, is of rapid growth, but rarely attains a size over 1 ft. in diameter. One was reported last year as 2 ft. 3 ins., but the sizes preferred for peeling are from 4 ins. and upwards. In peeling, the tree is first girdled about 5 ft. from the ground and the bark removed down to the base. It is then cut down, and the bark removed from the rest of the trunk and larger branches. The bark is then dried in the sun for four or five days, chopped up, and packed in sacks for shipment. The production last year was about 1,000 tons. From present appearances there will be an over-production in 1904, and not more than 2d. is offered for the dried bark.

"OIL OF LEMON" EXTRACTION IN CALIFORNIA.

Foreign Office Annual Series, No. 3185, June 1904.

California lemon growers are most anxious to obtain a machine for extracting "oil of lemon," the present process being unsatisfactory.

ACETIN: U.S. CUSTOMS DECISION.

June 17, 1904.

Merchandise invoiced as "Essigsäure," which on analysis was shown to contain 75 per cent. of mixed acetins, was held to be dutiable at 25 per cent. *ad val.* as a "chemical compound" under par. 3 of the tariff, and not as "acetic acid" under par. 1.—R. W. M.

AMYL ACETATE: U.S. CUSTOMS DECISION.

June 16, 1904.

Chemically pure amyl acetate was decided to be dutiable at 2 dols. per lb. as a "fruit ether" under par. 21 of the Tariff Act.—R. W. M.

ICHTHYOL: U.S. CUSTOMS DECISION.

June 10, 1904.

Ichthyol ammonium sulphonate, generally known in pharmacy as ichthyol, was held by the Board to be free of duty as "ichthyol" provided for in par. 626. Duty had been assessed at 25 per cent. *ad val.*, under par. 3, as a "chemical compound," or under par. 68 as a "medicinal preparation," on the ground that the ichthyol provided for in par. 626, which covers various oils, was the oil of ichthyol, and not the sulphonated ammonium salt (see J., 1903, 833). The Board held that the term "ichthyol," as used in the law, covers the sulphonated ammonium salt, and overruled the assessment of duty.—R. W. M.

Patent List.

N.B.—In these lists, [A.] means "Application for Patent," and [C.S.] "Complete Specification Accepted."

Where a Complete Specification accompanies an Application, an asterisk is affixed. The dates given are (i) in the case of Applications for Patents, the dates of application, and (ii) in the case of Complete Specifications Accepted, those of the Official Journals in which acceptances of the Complete Specifications are advertised.

Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, AND MACHINERY.

- [A.] 15,010. Reavell. Cooling towers for reducing temperature of condensing water and other liquids. July 5.
- " 15,129. Burdth. Cooling, heating, and similar apparatus. July 6.
- " 15,775. Martin. Filtering apparatus for the extraction of liquid from finely crushed minerals or the like. July 15.
- " 15,776. Ogle and the Cyanide Vacuum Filter Co. Apparatus for the separation of liquids from solids, particularly applicable to the extraction of metals from their ores. July 15.
- " 15,780. Withers (Bruyère). Distillation apparatus. July 15.
- [C.S.] 16,419 (1903). Junkers. Apparatus for heating liquids. July 20.
- " 16,472 (1903). Leetham. Apparatus for treating finely divided materials, such as flour, with a gaseous agent. July 13.
- " 22,094 (1903). Thompson (Blaisdell). Apparatus for discharging or filling vats and like receptacles. July 20.

[C.S.] 22,095 (1903). Thompson (Blaisdell). Distributing apparatus especially applicable for filling vats or the like. July 20.

" 13,186 (1904). Neel. Desiccation of liquids. July 20.

II.—FUEL, GAS, AND LIGHT.

- [A.] 14,947. Bayles. Fuel. [U.S. Appl., July 2, 1903.]* July 4.
- " 14,952. Baer and Co. Catalytic gas igniters. [Fr. Appl., July 18, 1903.]* July 4.
- " 14,971. Steins. Process and apparatus for the manufacture of generator gas.* July 4.
- " 15,088. Dixon. Gas washing, cooling, and heating towers. July 6.
- " 15,089. Dixon. Gas producer. July 6.
- " 15,269. Kermode. Burners for liquid fuel. July 8.
- " 15,270. Kermode. Apparatus for burning liquid fuel. July 8.
- " 15,271. Kermode. Apparatus for burning liquid fuel. July 8.
- " 15,800. Robins. See under XVIII. B.
- " 15,810. Robt. Dempster and Sons, and Radcliffe. Calciners and destructors. July 16.
- " 15,821. Mason. Apparatus for manufacturing producer- and water-gas. July 16.
- " 15,846. Spencer. Gas regenerative furnaces. July 16.
- " 15,862. Wilson. Furnaces for burning coal dust or like pulverulent fuel. July 16.

[C.S.] 23,659 (1903). Thompson (Best). Furnaces for burning liquid hydrocarbons. July 20.

" 23,660 (1903). Thompson (Best). Apparatus for burning liquid hydrocarbons in furnaces and fire boxes. July 20.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM, AND MINERAL WAXES.

- [C.S.] 23,659 (1903). Thompson (Best). See under II.
- " 23,660 (1903). Thompson (Best). See under II.
- " 7481 (1904). Kness. Process for solidifying petroleum and other mineral oils for their application as fuel and for lighting purposes. July 13. (Date applied for, Nov. 6, 1903.)

IV.—COLOURING MATTERS AND DYESTUFFS.

- [A.] 14,970. Imray (Meister, Lucius und Brüning). Manufacture of new dyestuffs of the anthracene series. July 4.
- " 14,972. Imray (Meister, Lucius und Brüning). Manufacture of yellow mordant dyestuffs. July 4.
- " 15,025. Shillito (J. R. Geigy). Manufacture or production of ortho-oxy-azo colouring matters. July 5.
- " 15,223. Imray (Basle Chem. Works). Manufacture of indoxyl, its homologues, and their derivatives. July 7.
- " 15,418. Shillito (J. R. Geigy). Manufacture of a-nitro-1-diazo-2-oxynaphthalene-sulphonic acid, or sulphonic acid of the nitro-naphthalene-1,2-diazoxide. July 11.

- [A.] 15,624. Abel (Act. - Ges. f. Anilin-fabrikation). Manufacture of 1.8-arylnaphthylaminesulphonic acids. July 13.
- [C.S.] 18,246 (1903). Newton (F. Bayer and Co.). Manufacture and production of pyrimidine derivatives. July 20.
- " 18,924 (1903). Read Holliday and Sons, Ltd., Turner, Dean, and Turner. Production or manufacture of colouring matters. July 13.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

- [A.] 15,080. Ma'her. Kiers for treating textile fabrics and the like. July 6.
- " 15,276. Sello. Method of producing dust-free consistent surgical dressing material.* July 8.
- " 15,297. Drewsen. Process of manufacturing products from cornstalks, sugar cane, and analogous pithy stalks.* July 8.
- " 15,331. Roberts and Crossley. Method and means employed for carbonising fibres. July 9.
- " 15,395. Venter. Process for bleaching textile fabrics.* July 9.
- " 15,615. Payne and Masterson. System of spirit dyeing. July 13.
- " 15,721. Ward and Kenworthy. Apparatus for dyeing, bleaching, and otherwise treating yarn, warp, and fibrous materials with liquid. July 15.
- " 15,729. Roberts and Crossley. Method of and means for removing vegetable impurities from woollen rags, wool, and other animal fibres. July 15.

VI.—COLOURING WOOD, PAPER, LEATHER, ETC.

- [A.] 15,424. Armitage, Jowett, and Sowry. Method of and apparatus for varnishing or otherwise coating paper or other materials. July 11.
- [C.S.] 9487 (1904). Boulton (Fabr. F. Schwartz and Co.). Wall paper. July 20.
- " 10,798 (1904). Tittel. Process and apparatus for the production of paper coated on one side with coloured material. July 20.

VII.—ACIDS, ALKALIS, AND SALTS.

- [A.] 14,966. Schilling and Kremer. *See under XVIII. B.*
- " 15,138. Gutensohn. *See under X.*
- [C.S.] 15,212 (1903). Hiebling. Manufacture of soda and caustic potash, chlorine, and hydrochloric acid by electrolysis of aqueous solutions. July 20.
- " 19,367 (1903). Bergmann. Method of producing di-calcium phosphate. July 13.
- " 12,797 (1904). Leduc and Griffiths. *See under X.*

VIII.—GLASS, POTTERY, AND ENAMELS.

- [A.] 15,662. Neuss. Method of producing different colours on pearl heads of solid glass-headed pins. July 14.
- " 15,866. Arbogast. Method of manufacturing glassware. [U.S. Appl., July 16, 1903.]* July 16.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

- [A.] 15,057. Muller. Manufacture of new pulverulent product for coating masonry or brickwork of furnaces, retorts, and the like. [Fr. Appl., July 8, 1903.]* July 5.
- " 15,142. Muller. Process for the manufacture of bricks and products with a facing of carborandum or other material. [Fr. Appl., July 13, 1903.]* July 6.
- " 15,176. Steenbock. Manufacture of vitreous cement.* July 7.
- " 15,181. Steenbock. Manufacture of material designed for the production of cement.* July 7.
- " 15,549. Broadbent. Burning of pipes, chimney pots, and other like earthenware goods in kilns or ovens. July 12.
- " 15,795. Rieter-Bodmer. Manufacture of artificial stone pipes, tiles, plates, vessels, and the like, and apparatus therefor. July 15.
- [C.S.] 218 (1904). Forell. Process for manufacturing cement from slag. July 13.
- " 8,559 (1904). Windholz. Process of making a grinding, polishing, or smoothing substance, or one refractory to heat. July 13.
- " 12,518 (1904). Watson. Material or composition to be used for damp courses, for covering roofs, surface of bridges, and the like, for insulation of electrical conductors, and other purposes of a like kind. July 13.

X.—METALLURGY.

- [A.] 14,980. Lébédéff. Process for smelting sulphurated copper ores and the simultaneous concentration of the matte. July 4.
- " 14,985. Cie. du Réacteur Métallurgique. Manufacture of steel, and treatment of copper, nickel, and like matts. [Fr. Appl., Aug. 6, 1903.]* July 4.
- " 15,138. Gutensohn. Recovering desired metal and oxides from acid solutions containing the same. July 6.
- " 15,141. Sir W. G. Armstrong, Whitworth, & Co., Ltd., and Ferry. Manufacture of steel and other forgings. July 6.
- " 15,220. Hadfield. Manufacture or treatment of armour plates and other articles of steel. July 7.
- " 15,347. Griesbach. Apparatus for utilising waste tin plate, scrap, and the like. July 9.
- " 15,577. Nicholas. Recovery of metals from ores, &c. July 13.
- " 15,592. Phillips and Pickering. Cyanide process of gold extraction. July 13.
- " 15,727. Twynam. Recovery of zinc from zinc cuttings and galvanised waste. July 15.
- " 15,776. Ogle and the Cyanide Vacuum Filter Co. *See under I.*
- " 15,792. Wrinkle and Wrinkle. Smelting furnaces. July 15.
- [C.S.] 12,797 (1904). Leduc and Griffiths. Process for the enriching of calcareous ores. July 13.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

- [A.] 15,294. Betts. Process of electro-depositing anti-mony. July 8.
- " 15,298. Betts. Process for treating metal mixtures produced as a by-product in electrolytic metal-refining operations. July 8.
- " 15,308. Betts. Process of making lead dithionate.* July 8.
- [C.S.] 15,212 (1903). Hiebling. *See under VII.*

XII.—FATTY OILS, FATS, WAXES, AND SOAP.

- [A.] 15,235. Wheelwright and Fiske. Process of cooking garbage and offal, and removing the oil or melted grease therefrom.* July 7.
- [C.S.] 19,163 (1903). Defavrie. Composition for the manufacture of phonographic cylinders and for other purposes. July 13.
- " 2081 (1904). Töllner. Process for manufacture of substitute for cod-liver oil. July 13.
- " 10,536 (1904). Haase. Candles. July 13.
- " 13,171 (1904). Hunter. *See under XX.*

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, ETC.

(A.)—PIGMENTS, PAINTS.

- [A.] 15,723. Adam. Carbon recovery plant for the manufacture of lamp-black and such like. July 15.
- " 15,754. Dunnett. Preparation for preventing incrustation of and preserving the hulls of sea-going ships. July 15.

(B.)—RESINS, VARNISHES.

- [C.S.] 12,647 (1904). Krämer. *See under XVII.*
- " 12,663 (1904). Melville, Rees, and Rees. Substitute for oilcloth or linoleum. July 20.

(C.)—INDIA-RUBBER.

- [A.] 15,436. Kittel. Process for regenerating vulcanised rubber waste.* July 11.

XIV.—TANNING, LEATHER, GLUE, SIZE, ETC.

- [A.] 15,449. Bossuet. Substitute for whalebone. [Fr. Appl., Dec. 16, 1903.]* July 11.
- " 15,629. Piesbergen. Artificial leather substitute and its method of manufacture.* July 13.
- [C.S.] 11,249 (1904). Amidon. Apparatus for treating hides, skins, and sides of leather. July 13.

XV.—MANURES, ETC.

- [A.] 15,709. Boutan. Manufacture of manures. [Fr. Appl., Aug. 13, 1903.]* July 14.

XVII.—BREWING, WINES, SPIRITS, ETC.

- [A.] 15,370. Boulton (Pabst Brewing Co.). Pasteurising apparatus.* July 9.

- [A.] 15,615. Payne and Masterson. *See under V.*

" 15,780. Withers (Bruyère). *See under I.*

- [C.S.] 23,327 (1903). Blaxter, Blaxter, and Chaloner. Apparatus for the production of non-deposit beer and the like, and for clarifying liquids and carbonating the same. July 13.
- " 12,647 (1904). Krämer. Apparatus for varnishing, pitching, or similarly treating casks, vats, or the like. July 13.

XVIII.—FOODS; SANITATION, WATER PURIFICATION; & DISINFECTANTS.

(A.)—FOODS.

- [A.] 15,020. Eichmann. Processes of preserving milk and cream. July 5.
- " 15,135. Priest. Manufacture of custard powder. July 6.
- " 15,370. Boulton (Pabst Brewing Co.). *See under XVII.*
- " 15,440. Imray (Maragliano). Manufacture of meat powder or meal, and process therefor. July 11.
- " 15,505. Petersson. Method of and apparatus for sterilising milk, cream, &c. July 12.
- " 15,605. Harris. Refrigerating and preserving meats, butter, milk, and other matter subject to decay. July 13.

- [C.S.] 15,319 (1903). Sandison. Treatment of fish, fish refuse, and the like. July 20.
- " 16,472 (1903). Leatham. *See under I.*
- " 18,428 (1903). Boulton (Rücker and Pickée). Preservatives and the method of applying them to foodstuffs and the like. July 13.
- " 19,760 (1903). Cleghorn. Process of preserving meat, fowl, fish, &c. July 20.
- " 10,758 (1904). Dunne. Means for preserving food, &c. July 20.

(B.)—SANITATION; WATER PURIFICATION.

- [A.] 14,929. Adams. Sewage filters. July 4.
- " 14,966. Schilling and Kremer. Process for extraction of ammonia from sewage waters and the like.* July 4.
- " 15,235. Wheelwright and Fiske. *See under XII.*
- " 15,276. Sello. *See under V.*
- " 15,800. Robins. Method and means for treating smoke, steam, sewer gas, impure air, and other fumes for the prevention or mitigation of a nuisance. July 15.
- " 15,829. Middleton. Filter and contact beds for the bacterial treatment of sewage. July 16.

- [C.S.] 8865 (1904). Bamberger, Böck, and Wanz. Process of and apparatus for regenerating breathed-out air for respiration purposes. July 20.
- " 12,232 (1904). McLean and Patterson. Treatment of sewage. July 13.

(C.)—DISINFECTANTS.

- [C.S.] 8415 (1904). Lake (F. Stearns and Co.). Antiseptic compounds, and processes for manufacturing them. July 13.

XIX.—PAPER, PASTEBOARD, Etc.

- [A.] 15,435. Gardner (Weiler-ter-Meer). Process for producing substances resembling celluloid. July 11.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

- [A.] 14,955. Gärtner. Polychlorals, and manufacture of same. July 4.
„ 15,784. Boulton (F. Fritzsche and Co.). Manufacture of protocatechuic aldehyde.* July 15.
[C.S.] 13,171 (1904). Hunter. Machine for extracting oil from the rind of limes and other citrus fruits. July 20.

XXII.—EXPLOSIVES, MATCHES, Etc.

- [A.] 15,053. Cocking and Kynoch, Ltd. Smokeless powders and their manufacture. July 5.
[C.S.] 19,438 (1903). Lundholm. Explosives. July 20.
„ 20,216 (1903). Bielefeldt. Explosives or blasting compositions. July 20.

XXIII.—GENERAL ANALYTICAL CHEMISTRY.

- [A.] 15,706. Thompson (Ver. Maschinenfabrik Augsburg und Maschinenbaugesellschaft Nürnberg A.-G.). Method for the continuous determination of the hydrogen contents of gaseous mixtures, and apparatus therefor.* July 14.



JOURNAL OF THE Society of Chemical Industry.

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Notices.

ANNUAL GENERAL MEETING, NEW YORK, 1904.

The Annual General Meeting will be held in New York City on Thursday, Sept. 8th, and following days. Members who propose to attend the meeting are requested to inform the General Secretary, as soon as possible, by what steamer they will travel. The principal boats will be met on arrival at New York by a representative of the Reception Committee, who will escort the guests to the Hotel Seville, Madison Avenue and 29th Street, which will be the Society's Headquarters in New York. A similar system will be observed at all the other cities visited by the special train. A revised programme appeared in the March 31st issue.

In accordance with the provisions of Rule 18 of the Bye-laws, notice is hereby given that those members whose names are printed in *italics* in the list of Council will retire from their respective offices at the forthcoming Annual Meeting.

Mr. Wm. H. Nichols has been nominated to the office of President under Rule 8; Dr. Edw. Divers, Prof. W. R. Eaton Hodgkinson, Mr. Max Muspratt, and Mr. T. J. Parker have been nominated Vice-Presidents under Rule 8; and Sir Wm. Ramsay has been nominated a Vice-President under Rule 11.

Mr. Oscar Guttman, Prof. W. R. Lang, Dr. Boverton Redwood, and Mr. Walter F. Reid, have been nominated under Rule 18 to fill four vacancies among the Ordinary Members of Council. No ballot will be required.

The Hon. Treasurer and Hon. Foreign Secretary have been nominated for re-election to their respective offices.

COMMUNICATIONS.

Authors of communications read before the Society, or any of its Local Sections, are requested to take notice that under Rule 43 of the Bye-laws the Society has the right of priority of publication for three months of all such papers. Infringement of this Bye-law renders papers liable to be rejected by the Publication Committee, or ordered to be abstracted for the Journal, in which case no reprints can be furnished to the author.

Changes of Address.

When notifying new addresses, members are requested to write them distinctly, and state whether they are temporary or permanent. Multiplication of addresses is also to be avoided as tending to create confusion. When sending subscriptions, the use of the form attached to the application helps in the verification of addresses, on which the safe delivery of the Journal depends.

Akitt, T.; Journals to Mijnbouw Maatschappij Kataboen, Lebong Soelit, Benkoelen, Sumatra; subscriptions as before.

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Forth, H.; Journals (temporarily) to 32, Queen Street, Manchester.

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London Section.

Meeting held on June 6th, 1904.

ERRATA.

THE LOSS OF NITRE IN THE CHAMBER PROCESS.

BY J. K. H. INGLIS.

(This J., June 30th, 1904, 643-645.)

DISCUSSION.

ON p. 645, col. 1, for author's reply, read as follows:—

MR. INGLIS, in reply, said that the amount of nitrous gases found in the bulbs corresponded to 50 per cent. of the total loss of nitre. But if pure nitric oxide were condensed in a bulb at the temperature of liquid air, and the bulb then evacuated by means of a mercury pump, it was found that the nitric oxide had an appreciable vapour pressure at that temperature, therefore the whole of the nitric oxide in the flue gases could not be condensed, and some of it would be lost. Hence the total amount accounted for was at least greater than 50 per cent. of the whole loss. It was impossible to state whether the main loss was as nitric oxide or nitrogen peroxide, for the latter seemed to interact with sulphur dioxide in the bulb, and nitric oxide would be one-product of this reaction.

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PATENT SPECIFICATIONS may be obtained by post by remitting as follows:—

English.—*£*2. each, to the Comptroller of the Patent Office, G. N. Dalton, Esq., Southampton Buildings, Chancery Lane, London, W.C.

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I.—PLANT, APPARATUS, AND MACHINERY.

ENGLISH PATENTS.

Casks, Boxes, and other Receptacles; Impermeable Coatings or Linings for — J. Wetter, London. From the firm of Hugo Blank, Berlin. Eng. Pat. 16,490, July 27, 1903.

THE cask, &c. is coated with a solution of casein, albumose, or glue or gelatin products in water, ammonia, or other suitable solvent, and the layer, after drying, treated with formaldehyde. Or, formaldehyde may be mixed with the coating solution before use.—C. A. M.

Distillation Apparatus. A. Gerhardt, Kassel, Germany. Eng. Pat. 18,869, Sept. 1, 1903.

SEE Fr. Pat. 335,084 of 1903; this J., 1904, 111.—T. F. B.

UNITED STATES PATENTS.

Drying Materials; Method of — L. Gathmann, Washington. U.S. Pat. 763,387, June 28, 1904.

AIR is caused to pass downwards through the chamber containing the material to be dried, and is there heated so as to cause it to take up the vapour to be expelled. The saturated air is then passed to a lower level, where it is cooled, and the vapour condensed. The same air is then again passed through the drying space, being used continuously.—W. H. C.

Drying Substances; Method of — L. Gathmann, Washington. U.S. Pat. 763,388, June 28, 1904.

THE process is similar to that of the foregoing U.S. Pat. 763,387, with the exception that the condensation takes place in a separate vessel, connected by pipes to the drying chamber.—W. H. C.

Drying Kiln. J. F. Hanrahan, Ottawa. U.S. Pat. 764,583, July 12, 1904.

SEE Eng. Pat. 4602 of 1904; this J., 1904, 537.—T. F. B.

Evaporating Apparatus; Piled Vacuum — T. Suzuki, Sunamura, Japan. U.S. Pat. 764,393, July 5, 1904.

SEE Eng. Pat. 3165 of 1904; this J., 1904, 483.—T. F. B.

Aerating Liquids; Apparatus for — F. G. Hampson, London. U.S. Pat. 764,461, July 5, 1904.

SEE Eng. Pats. 11,612 and 16,352 of 1901; this J., 1902, 984 and 1191.—T. F. B.

FRENCH PATENTS.

Filtering Liquids; Process for — G. Stade, Germany. Fr. Pat. 340,322, Feb. 10, 1904.

THE flow of the liquid on to the filtering medium (which is preferably sand) is so arranged that the stream of liquid is broken up, and does not disturb the surface of the sand.

—W. H. C.

Vacuum; Apparatus for Supplying a — by the Circulation of a Liquid. C. W. Stanton. Fr. Pat. 340,885, March 2, 1904. Under Internat. Conv., Dec. 17, 1903.

SEE Eng. Pat. 5791 of 1904; this J., 1904, 538.—T. F. B.

II.—FUEL, GAS, AND LIGHT.

Coal Analysis; A Frequent Cause of Error in — J. Alix and Bay. XXIII., page 800.

Spirit; Production of Cheap — for Technical Purposes. Delbrück. XVII., page 796.

ENGLISH PATENTS.

Tar [for Briquettes, &c.]; Method of Solidifying — S. G. Coulson. Eng. Pat. 2102, Jan. 28, 1904. III., page 780.

Gas Producers; Regulation of [Suction] — W. J. Crossley and T. Rigby, Manchester. Eng. Pat. 13,763, June 20, 1903.

THE patentees state that the difficulty experienced in making good gas, in a suction producer which is subject to a varying demand for gas, may be largely overcome if the proportion of steam to air is reduced while the demand is low, and raised to the maximum at full load. The cooling of the fire by an excess of steam is thus avoided. To effect the required automatic regulation of the proportions, one part of the air supply to the producer (the primary supply)

is led directly to the fire-grate through an inlet of such an area as to be always working practically at its fullest, even at low loads. The secondary air supply is passed through a chamber in which it mixes with steam, and thence to the fire-grate, where it mixes with the primary air supply. Any variations in the suction applied to the producer affect mainly the secondary supply, as the primary is almost constant, and hence an increase in the rate of suction causes a corresponding increase in the ratio of steam to air (see following abstract).—H. B.

Gas Producers [Suction]. W. J. Crossley and T. Rigby, Manchester. Eng. Pat. 13,764, June 20, 1903.

To prevent the adhesion of clinker to the refractory lining of the producer (which is of the up-draught type), the fire-grate is fixed in the centre of an air-tight bottom plate, a few inches below the foot of the refractory lining. Annular box-castings are arranged concentrically in the space between the foot of the lining and the bottom plate, and act as superheaters for the air and steam passing through on their way to the under side of the fire-grate. A steam-generating device is provided on the top of the producer, surrounding the fuel hopper and depending into the combustion chamber. The secondary air supply is drawn through this chamber, and passes, mixed with steam, down to the superheaters mentioned above. The primary air supply enters directly below the fire-grate. The action of the primary and secondary air supplies is that described in the preceding abstract.—H. B.

Gas Producers [for Bituminous Fuel]. J. Fielding, Gloucester. Eng. Pat. 15,966, July 20, 1903.

THE producer, which carries a feed hopper above and rests upon a water-sealed foundation as usual, is provided a little above its middle height with an annular conical grate, through which the air (or air and steam) supply enters in a substantially horizontal direction, suitable ducts being arranged near the base of the producer for leading off the gas generated. By this arrangement the air, or air and steam, is brought into the combustion chamber below the level of the raw fuel, directly into the incandescent zone, and is then deflected downwards so as to pass through the whole body of incandescent fuel.—H. B.

Gas; Method of and Apparatus for the Manufacture of —. G. Westinghouse, London. From A. M. Gow, Edgewood Park, Pa., U.S.A. Eng. Pat. 17,215, Aug. 7, 1903.

SEE U.S. Pat. 742,411 and 742,412 of 1903; this J., 1903, 1287.—T. F. B.

Water-Gas, Producer-Gas, and the like; Process and Apparatus for the Production of —. P. Schmidt, Hanover. Eng. Pat. 24,935, Nov. 16, 1903.

SEE Fr. Pat. 338,626 of 1903; this J., 1904, 653.—T. F. B.

Alkaline Prussiates; Manufacture of —. G. E. Davis. Eng. Pat. 20,069, Sept. 17, 1903. VII., page 787.

UNITED STATES PATENTS.

Gas-Producer. P. J. Buckley, Waukesha. U.S. Pat. 763,460, June 28, 1904.

AIR circulates through chambers in the walls of the producer and is then led through a closed feeding-hopper, containing the raw fuel, after which it is passed into the combustion chamber of the producer. The discharge valve of the hopper is carried by the air-inlet pipe, which extends vertically down the centre of the hopper and is connected at its upper end to branch pipes entering telescopically the pipes which lead the hot air from the chambers in the walls of the producer.—H. B.

Gas; Process of Making —. D. Turk, Riesa, Germany, Assignor to F. J. Maly, Aussig, Austria-Hungary. U.S. Pat. 764,320, July 5, 1904.

SEE Eng. Pat. 23,662 of 1900; this J., 1901, 1197.—T. F. B.

Carbon [Graphite]; Separating — from Pulverised Carbonaceous Materials. J. D. Darling, Philadelphia. U.S. Pat. 763,859, June 28, 1904.

POWDERED carbonaceous material, such as graphitic ore, mixed with oil, is mechanically agitated under a body of water divided horizontally by an obstruction (on which the mixture rests) impervious to the commingled oil and carbon, but pervious to the water and gangue. A flow of water enters above the obstruction, below which it has its outflow, thus maintaining a downward current of water through the "forminate partition."—E. S.

FRENCH PATENTS.

Fuel; Artificial or Compound —. International Fuel Co. Fr. Pat. 340,779, Feb. 19, 1904.

SEE Eng. Pat. 3781 of 1904; this J., 1904, 601.—T. F. B.

Furnace for Burning Tan and similar Fuel. D. M. Myers. Fr. Pat. 340,849, March 1, 1904. Under Internat. Conv., March 2, 1903.

SEE Eng. Pat. 5045 of 1904; this J., 1904, 653.—T. F. B.

Coke; Apparatus for Electrically Separating — from Cinders, &c. H. Lelarge. Fr. Pat. 340,898, March 2, 1904.

SEE Eng. Pat. 5799 of 1904; this J., 1904, 653.—T. F. B.

[Acetylene] Gas Generator with Warm Chamber.

F. Fescourt and C. Maurin. Fr. Pat. 340,227, Feb. 6, 1904.

THE generator, in which gas is produced by the action of water on carbide of calcium or the like, is characterized by the arrangement, above the bell in which the gas is liberated, of a "warm chamber" through which the gas is led before leaving the apparatus, "in order to be dried by the heat developed by the decomposition of the substances producing the gas."—H. B.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM AND MINERAL WAXES.

ENGLISH PATENTS.

Distillation of Organic Substances; Dry —. H. C. Aminoff, Domnarfvet, Sweden. Eng. Pat. 17,973, Aug. 19, 1903.

SEE U.S. Pat. 748,457 of 1903; this J., 1904, 113.—T. F. B.

Tar [for Briquettes, &c.]; Method of Solidifying —. S. G. Coulson, Sheffield. Eng. Pat. 2102, Jan. 28, 1904.

TAR is mixed, at 140° to 150° F., with one-tenth to one-eighth of its weight of concentrated sulphuric acid, the addition of acid being performed so that the temperature does not rise above 250° F. The mixture is then allowed to cool in suitable moulds, when it is intended for use as a binding material for fuel, road-making materials, &c.

—T. F. B.

UNITED STATES PATENT.

Wood; Process of Destructive Distillation of —. G. O. Gilmer, New Orleans, Assignor to Illinois Investment Co., West Virginia. U.S. Pat. 762,303, June 14, 1904.

WOOD is distilled in a retort slightly inclined to the horizontal, by applying heat to the upper portion only of the body of wood, the application of heat being so controlled as to cause the heated zone to pass gradually downwards through the wood. The vapours evolved are drawn off from the bottom of the lower end of the retort in several fractions.

—T. F. B.

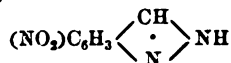
IV.—COLOURING MATTERS AND DYE STUFFS.

Trialkylated Amidines; Preparation of — J. v. Braun. Ber., 1904, 37, 2678—2685.

THE author has investigated the action of phosphorus pentachloride on dialkylated acid amides of the benzene and naphthalene series, and finds that in a suitable organic solvent, such as chloroform, these substances react smoothly and readily to form aminochlorides, according to the equation $R_1 \cdot CO \cdot NR_2 + PCl_5 = R_1 \cdot CCl_2 \cdot NR_2 + POCl_3$. The products are extremely stable in absence of air. With water they re-form the original acid amides with violent evolution of hydrochloric acid. By precipitating the aminochlorides from chloroform solution with light petroleum spirit, washing out the phosphorus oxychloride with more petroleum spirit, and then acting on them with primary amines in chloroform solution, amidines are readily and rapidly formed. In this way it is possible to form amidines containing groups which could not hitherto be introduced into the molecule.—E. F.

Indazoles from Nitrated Orthomethylated Amines; Formation of — E. Noeltling. Ber., 1904, 37, 2556—2597.

WHEN a diazotised nitro-derivative of *o*-toluidine is decomposed by boiling its solutions or by letting its neutral aqueous solution or solution in acetic acid stand, the two main products of the reaction are the corresponding phenol and indazole. Thus the diazo compound from *o*-nitro-*o*-toluidine, $C_6H_3(CH_3)(NH_2)(NO_2)[1.2.3]$, yields *o*-nitro-*o*-cresol, and *o*-nitro-indazole—



The proportions of these two substances which are formed vary greatly, both with the constitution of the original diazo compound and with the conditions under which the reaction takes place, it being often possible to obtain the one or the other product quantitatively. The author has systematically investigated the proportions of cresol and indazole formed from the diazo compounds of 23 mono- and dinitrated *o*-toluidines and homologues on boiling with mineral acids, with dilute acetic acid, and in neutral aqueous solution, and also on standing in glacial acetic acid solution at the ordinary temperature, and has tabulated the results. The following general conclusions were arrived at:—

(a) *o*-Nitramines. — On boiling with mineral acids, 80—100 per cent. of indazole is formed. An additional methyl group in *o*-position to the methyl group which takes part in the ring-formation exerts a favourable, a methyl group in *p*-position to the amino group an unfavourable effect. On heating with dilute acetic acid, or letting stand with glacial acetic acid, the yields of indazole are, in general, smaller.

(b) *m*-Nitramines. — On warming the diazo solutions with dilute mineral acids, cresols are mainly formed, *p*-methylated derivatives yielding cresols only. Theoretical yields of cresol are formed in all cases by dropping the diazo liquid into boiling dilute mineral acid. On boiling with glacial acetic acid, about 80 per cent. of indazole is formed. Even *p*-methylated derivatives give similar yields of indazole on adding the cold solution of the diazo compound in glacial acetic acid to boiling glacial acetic acid. Glacial acetic acid solutions of the diazo compounds give almost quantitative yields of indazole on standing. *p*-Methylated derivatives yield large amounts of by-products when treated in this way.

(c) *p*-Nitramines. — These yield phenols quantitatively on boiling the diazo solutions with mineral acid. Indazoles are obtained in yields of 80 per cent. on letting the glacial acetic acid solutions stand in the cold.

(d) *Dinitramines*. — Satisfactory yields of indazole are obtained on boiling mineral acid solutions of the diazo compounds, 80 per cent. yields on dropping them into

dilute boiling sulphuric acid. *p*-Methyl groups exert a very unfavourable effect on the indazole formation. The diazo solutions are very unstable even in the cold, forming reddish-brown by-products.

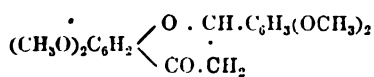
In general, by-products are formed in this reaction, especially in the case of the *p*-methylated compounds and on boiling in acetic acid solution. These consist of nitro derivatives of toluene-azo-indazoles and of oxyazo compounds, together with nitrogenous substances of unknown constitution which are very insoluble. Nitro-indazoles are white to yellow substances which can be sublimed, and are either non-volatile or scarcely volatile in a current of steam. They are usually easily soluble in alcohol, in glacial acetic acid, and in acetone. They have weakly basic and rather more strongly marked acid properties. The imino hydrogen can be replaced by alkyl and by acetyl groups. Nitro-indazoles do not react with diazo compounds. They can be readily reduced in acid solution to amino-indazoles which are strong bases, which condense with dimethyl-*p*-aminobenzaldehyde to form strong yellow dyestuffs and can be readily diazotised in acid solution. The diazo compounds react with amines and phenols to form dyestuffs which have a weak affinity for unmordanted cotton. Amino-indazoles also react with diazo compounds to form dyestuffs which show a weak affinity for unmordanted cotton.—E. F.

Diphenyl- and Triphenylmethane Dyestuffs; Basic — II. J. v. Braun. *p*-Diaminodiphenylmethane; Derivatives of — J. v. Braun and E. Kayser. Ber., 1904, 37, 2670—2678. (See also this J., 1904, 318.)

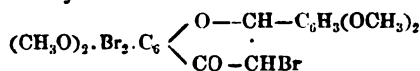
NEITHER auramine base nor Michler's ketone could be smoothly converted into the corresponding cyanomethylated compounds by means of cyanogen bromide. On the other hand, the authors were able to obtain *p*-dicyanodimethyldiaminodiphenylmethane, $[(CH_3)(CN) \cdot N \cdot C_6H_4]_2 : CH_3$, in good yields by the action of cyanogen bromide on *p*-tetramethyldiaminodiphenylmethane. The product, a white crystalline substance, can be easily oxidised to the corresponding ketone, $[(CH_3)(CN) \cdot N \cdot C_6H_4]_2 : CO$, but the preparation of the corresponding auramine, $[CH_3(CN) \cdot N \cdot C_6H_4]_2 : NH$, in a pure state, which was the ultimate object of the authors, was found to be extremely difficult. *s*-Dimethyldicyanodiaminobenzophenone reacts readily with hydroxylamine to form the corresponding oxime, but does not react with tertiary aromatic bases in presence of phosphorus oxychloride, nor was it found possible to form dimethyldicyanodiaminotriphenyl carbinol from it by Grignard's reaction with magnesium bromobenzene. By the action of mineral acids dicyanodimethyldiaminodiphenylmethane is converted into *s*-dimethyldiaminodiphenylmethane, $[CH_3 \cdot NH \cdot C_6H_4]_2 : CH_3$, a substance already described in Ger. Pat. 68,011, according to which it is formed by the action of formaldehyde on methylaniline. With benzylbromide it forms *s*-dimethyldibenzoyldiaminodiphenylmethane, the solutions of which in organic solvents and in aqueous acids are pale blue in colour. This latter is a well-defined crystalline substance, very different in properties to the product described under the same name in Ger. Pat. 68,665. On treatment with mineral acids *s*-dimethyldicyanodiaminobenzophenone can be converted into *s*-dimethyldiaminobenzophenone, $[CH_3 \cdot NH \cdot C_6H_4]_2 : CO$. The solutions of this substance in organic solvents and in aqueous acids have an intense yellow colour. With cyanogen bromide the original dicyano compound is re-formed. The substance also forms a pale yellow nitroso compound, $[(CH_3)(NO)N \cdot C_6H_4]_2 : CO$ and a colourless, crystalline dibenzoyl compound $[(C_6H_5CO)(CH_3)N \cdot C_6H_4]_2 : CO$ which does not agree in properties with the product obtained by Nathanson and Müller for the action of benzoyl chloride on Michler's ketone (this J., 1889, 978).—E. F.

Luteolin; A Second Synthesis of — S. Fainberg and St. v. Kostanecki. Ber., 1904, 37, 2625—2627.

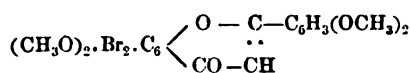
1.3.3'.4'-TETRAMETHOXYFLAVANONE—



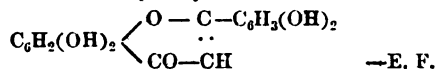
is converted by the action of bromine into 2.4.α-tribromo-tetramethoxyflavone—



On treatment with alcoholic potassium hydroxide this forms 2.4-dibromo-1.3.3'.4'-tetramethoxyflavone—

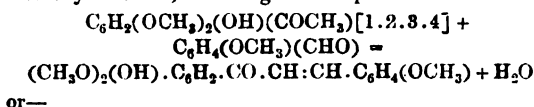


which on saponification and simultaneous elimination of bromine, by boiling with hydriodic acid, yields luteolin, which is 1.3.3'.4'-tetrahydroxyflavone—

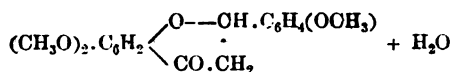


3.4.2'-Trihydroxyflavonol. S. S. Cohen and St. v. Kostanecki. Ber., 1904, 37, 2627—2631.

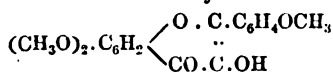
By the action of gallacetophenonedimethyl ether on salicylaldehydemethyl ether, 2'-hydroxy-3'.4'.2-trimethoxychalkone is formed, either alone or mixed with 3.4.2'-trimethoxyflavone, according to the equations—



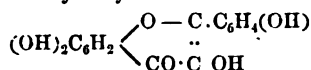
or—



The first of these products, the chalkone, is converted into the second by boiling with dilute mineral acids. 3.4.2'-Trimethoxyflavone is converted by amyl nitrite and hydrochloric acid into the isonitroso compound, which on boiling with a mixture of acetic and dilute sulphuric acids, is converted into 3.4.2'-trimethoxyflavonol—



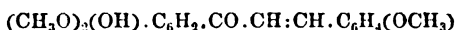
The latter is demethylated by boiling with hydriodic acid, forming 3.4.2'-trihydroxyflavonol—



This compound dyes in intense orange-yellow shades on alumina, and brown to black on iron mordant. Almost exactly the same dyeings are obtained with 3.4.3'-trihydroxyflavonol, described in the next abstract.—E. F.

3.4.3'-Trihydroxyflavonol. St. v. Kostanecki and O. Schleifenbaum. Ber., 1904, 37, 2631—2633.

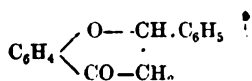
2'-HYDROXY-3'.4'.3-TRIMETHOXYCHALKONE—



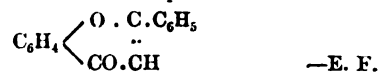
was obtained by the action of gallacetophenonedimethyl ether on m-methoxybenzaldehyde. This was converted, by the methods described in the last abstract, successively into the corresponding flavanone, an isonitroso derivative of the same, 3.4.3'-trimethoxyflavonol, and finally into 3.4.3'-trihydroxyflavonol, which closely resembles the corresponding 3.4.2' compound in properties.—E. F.

Flavanone and Flavone; Synthesis of —. St. v. Kostanecki and W. Szabrański. Ber., 1904, 37, 2634—2635.

o-METHOXYACETOPHENONE was demethylated by heating with hydrochloric acid, forming o-hydroxyacetophenone. This yields 2'-hydroxychalkone with benzaldehyde according to the equation $\text{C}_6\text{H}_4(\text{OH})(\text{COCH}_3) + \text{C}_6\text{H}_5 \cdot \text{CHO} = \text{C}_6\text{H}_4(\text{OH}) \cdot \text{CO} \cdot \text{CH} : \text{CH} \cdot \text{C}_6\text{H}_5 + \text{H}_2\text{O}$. On boiling with dilute hydrochloric acid in alcoholic solution this forms flavanone—

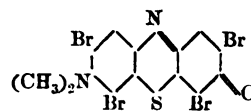


a substance of pleasant, faintly aromatic odour, crystallising in colourless needles, and soluble in concentrated sulphuric acid to a pale yellow, and in alcoholic sodium hydroxide to an orange-yellow solution. With bromine it yields α-bromoflavanone, which is converted by alcoholic potassium hydroxide solution into pure flavone—



Immedial Pure Blue. R. Gnehm and F. Kaufler. Ber., 1904, 37, 2617—2623.

IMMEDIAL Pure Blue, obtained by melting p-dimethylamino-p-hydroxydiphenylamine with sulphur and sodium sulphide according to Ger. Pat. 184,947, was purified by means of the hydrochloride of the leuco compound, which was isolated, oxidised in alkaline aqueous suspension in a current of air, and finally freed from unchanged diphenylamine derivative and from Methylene Violet by washing with dilute acid. The purified dyestuff was heated with potassium bromate and aqueous hydrobromic acid in a sealed glass tube to 115°—125° C. From the products of this reaction, nitrobenzene extracts 30—50 per cent. of a finely crystalline reddish-violet product, which is very insoluble in most other ordinary solvents. The analysis and molecular weight determination agree with the empirical formula $\text{C}_{14}\text{H}_8\text{ON}_2\text{SBr}_4$. A determination of the methyl groups attached to nitrogen agreed with the presence of a dimethylamino group. The substance does not change colour on boiling with acetic anhydride, and is insoluble in alkali, and therefore does not appear to contain free amino- or hydroxy groups, and one must assume that the sulphur takes part in the ring-formation. These considerations lead the author to the formula—



for this substance, that is, a tetrabromo derivative of Methylene Violet. The position of the bromine atoms is uncertain, and it was not found possible to completely eliminate them. The substance is reduced by stannous chloride and glacial acetic acid to a leuco compound, soluble in alkali, which is readily reoxidised to the original substance. On heating Immedial Pure Blue with sodium chlorate and hydrochloric acid in a sealed tube to 130° C., tetrachloroquinone was obtained, the yield being about 20 per cent.—E. F.

ENGLISH PATENTS.

Azo Dyestuffs; Manufacture of [Black] —. G. B. Ellis, London. From Chem. Fab. vorm. Sandoz, Basle. Eng. Pat. 14,768, July 2, 1903.

BLACK azo dyestuffs, suitable for use in wool dyeing, are obtained by combining in alkaline solution diazotised amino and aminoazo compounds of the benzene and naphthalene series and their sulphonic acids with 1.8-aminonaphthol-3.6-disulphonic acid, diazotising the resulting compounds, and combining with amino and hydroxy derivatives of naphthalene and their sulphonic acids. For example, 2.6.8-naphthylaminedisulphonic acid is diazotised and coupled with α-naphthylamine, the product is diazotised and combined with 1.8-aminonaphthol-3.6-disulphonic acid, and the compound thus formed is in turn diazotised and combined with α-naphthylamine. The dyestuff finally obtained dyes wool in blue-black shades, which are turned to deep black by subsequent treatment with potassium bichromate.—E. F.

Acetdiamidophenolsulpho Acid [Azo Dyestuffs]; New —, and Colouring Matters therefrom. R. B. Ransford, Upper Norwood. From L. Cassella and Co., Frankfort-on-Maine. Eng. Pat. 17,792, Aug. 17, 1903.

NITROAMINOPHENOLSULPHONIC acid ($\text{OH} : \text{NO}_2 : \text{NH}_2 : \text{SO}_3\text{H} = 1:2:6:4$) is acetylated and reduced. The acetyldiaminophenolsulphonic acid thus obtained gives, when diazotised and combined with phenols and amines, azo

dyestuffs of great technical value. Those produced from a number of naphthol- and aminonaphtholsulphonic acids, applied in an acid bath and after-treated on the fibre with potassium bichromate, dye wool in shades ranging from violet to black; thus, for example, the dyestuff prepared from 1.8.4-aminonaphtholsulphonic acid dyes wool a violet, which changes to a blue-black colour on chroming, the dyeing produced being, it is stated, exceedingly level and fast to washing, milling, and light. (Compare this J., 1904, 56.)—E. B.

UNITED STATES PATENT.

Nitramines [Nitro Compound]; Process of Reacting on — with Formaldehyde and a Product thereof. B. Homolka and J. Erber, Assignors to Farbwerke vorm. Meister, Lucius und Brüning, Höchst a/M. U.S. Pat. 763,756, June 28, 1904.

SALTS of primary aromatic nitramines are acted upon in aqueous solution by formaldehyde. The compound thus produced from *p*-nitro-*o*-toluidine ($\text{CH}_3\text{:NH}_2\text{:NO}_2=1:2:4$), of m. pt. 107°C ., is a yellow crystalline substance, melting at 230°C ., insoluble in water, almost insoluble in most of the usual organic solvents, but soluble in hot, glacial acetic acid.—E. B.

FRENCH PATENTS.

Anthracene Dyestuffs. Cie. Paris. Coul. d'Aniline. Fr. Pat. 338,756, April 16, 1903.

THE halogen derivatives of 1.5- and 1.8-aminoanthraquinonesulphonic acids (see Fr. Pat. 334,576; this J., 1904, 57) are condensed with primary aromatic amines, the resulting products being sulphonated. A dyestuff which dyes unmordanted wool in pure blue shades is thus obtained by brominating the 1.8-isomeride, condensing with *p*-toluidine, and sulphonating. (See U.S. Pats. 748, 375, 754, and 768; this J., 1904, 113 and 368.)—E. B.

Sulphide Dyestuffs derived from the Indophenol, $\text{HO.C}_6\text{H}_4\text{.N:C}_6\text{H}_4\text{:O}$, and its Homologues; Blue —. Act.-Ges. f. Anilinfabr. Fr. Pat. 338,761, April 18, 1903.

IN Fr. Pat. 303,524, reference is made to a dyestuff which is formed by the action of sodium sulphide (4 parts) and sulphur (1 part) upon the "simplest" indophenol, of the formula $\text{HO.C}_6\text{H}_4\text{.N:C}_6\text{H}_4\text{:O}$, and which is therein described as being of no value. Later (Fr. Pat. 315,669; this J., 1902, 543), it was discovered that, in the case of the sulphide dyestuffs derived from the indophenols generally, better yields are obtained when the proportion of sulphur employed in the reaction (in aqueous solution at 100°C .) is increased so as to be sufficient for the possible formation with the sodium sulphide of sodium pentasulphide. It is now found that not the yield only, but the nature of the product also is influenced by such increase, which is especially noticeable with the indophenol of the formula given above and its homologues. A valuable dyestuff is, for example, produced by heating together in aqueous solution at $110^\circ\text{--}115^\circ\text{C}$. for 24 hours a mixture of the sodium compound of the "simplest" indophenol (30 kilos.) with sulphur (80 kilos.) and crystallised sodium sulphide (150 kilos.). The product dyes from a sodium sulphide bath unmordanted cotton in deep greenish-blue shades, which are converted by oxidising agents into indigo-blue shades of great fastness.—E. B.

Diazo Dyestuffs [Azo Dyestuffs]. Badische Anilin und Soda Fabrik. Fr. Pat. 338,782, May 4, 1903.

1.5-DIHYDROXYNAPHTHALENE is coupled with two molecular proportions of the same diazo-salt or of dissimilar diazo salts. The products dye wool in shades ranging from red to blue. The dyestuff prepared from two molecular proportions of *o*-diazophenolsulphonic acid dyes a violet shade, which becomes black on chroming.—E. B.

Aminothioaliphyl Derivatives and Azo Sulphide Dyestuffs derived therefrom; Production of New —. [Azo Dyestuffs.] Soc. pour l'Ind. Chim. à Bâle. First Addition, dated Jan. 19, 1904, to Fr. Pat. 337,329, Nov. 5, 1903.

WHERE the dinizothioaliphyl compounds mentioned in the principal patent (this J., 1904, 486) are completely reduced, new diamino compounds are produced, which, on being

diazotised and combined with amines or phenols, &c., or coupled with diazo compounds, give rise to new dyestuffs which possess the property of dyeing unmordanted cotton. A series of mononitrothioaliphyl compounds has also been prepared by substituting the corresponding mononitro compounds for the dinitro intermediate compounds previously named (*loc. cit.*). New dyestuffs result when the mono-amino compounds derived from these are diazotised and coupled with amines and phenols, &c., or are themselves coupled with diazo compounds. In place of the amino-thioaliphyl compounds, amino-alphylsulphides and the corresponding xanthates can also be employed.—E. B.

Azo Dyestuffs; Electrolytic Method for Preparing —. C. F. Boehringer und Soehne. Fr. Pat. 340,447, Feb. 15, 1904.

SEE U.S. Pat. 761,310 of 1904; this J., 1904, 712.—T. F. B.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

Natural and Artificial Silks; Differentiation of —. A. Herzog. Z. Farben- u. Textil-Chem., 1904, 3, 259—260.

IF an artificial silk fibre be dyed, and then, after suitable mounting, be examined under a microscope fitted with a Nicol's prism, it shows dichroic effects when moved into different positions with regard to the plane of vibration of the light passing through the Nicol. In the case of natural silks there is either no dichroic effect or else it is quite inappreciable. It is of interest to note that these optical effects persist through all the changes from cellulose to artificial silk.—A. B. S.

Weighted Silk; Action of Hydrofluosilicic Acid on —. R. Gnehm. Z. Farben u. Textil-Chem., 1904, 3, 258—259.

THE extraction of a sample of black weighted silk with hydrofluosilicic acid gave results which varied enormously according to the conditions of treatment. Such small changes as, e.g., drying the silk between two acid treatments, had quite an important influence on the results. The usual weighting material (tin-phosphate-silicate) appears to be acted on quite differently from one containing alum. The amount of the weighting material extracted by the acid varied, in the different experiments, from 20 to 65 per cent. (see also this J., 1903, 968).—A. B. S.

Cotton from North-Eastern Rhodesia and British Central Africa. Bull. Imp. Inst. (Suppl. to Board of Trade J.), 1904, 2, 90 and 87).

FOUR samples of cotton grown near Mirongo Station, in the Senga country, have been examined. (1) *Mirongo-Senga*: A cotton of creamy colour, with a faint reddish tinge, having a soft, silky staple, 1.2—1.4 ins. long. Value, $7\frac{1}{2}d$ — $8d$. per lb. (2) *Katumbi-Senga*: Cotton of good creamy colour, with weak and irregular staple, 1.3—1.5 ins. long. Value, $7\frac{1}{2}d$ — $7\frac{1}{2}d$. per lb. (3) *Mirongo-Egyptian*: Soft, silky cotton of pale reddish-brown colour, with a rather irregular staple, 1.3—1.5 ins. long. Value, $8\frac{1}{2}d$. per lb. (4) *Katumbi-Egyptian*: Cotton similar to (3), but rather paler in colour. The staple was "neppy," less silky than that of (3), and had a length of 1.3—1.5 ins. Value, $8\frac{1}{2}d$. per lb.

TWO samples from British Central Africa were also examined, one from Zomba and the other from North-Eastern Rhodesia. The Zomba specimen was somewhat harsh and of a yellowish colour, with occasional buff-coloured stains where the cotton was "perished"; it contained fragments of broken seeds together with a few whole seeds, and had a staple 24—32 mm. in length. The cotton, free from seeds, and properly cleaned, would be worth about 5d. per lb. on the spot. The Rhodesian specimen consisted of wild cotton, which had not been ginned; it was fairly silky, of white to yellowish colour, with occasional buff-coloured stains, and had a staple of 23—33 mm. If properly prepared, it would be worth 4½d. per lb. on the spot. The seed freed from cotton would be worth about 4l. 5s. per ton.—A. S.

Cotton (Gossypium Barbadosense) from South Australia.
Bull. Imp. Inst. (Suppl. to Board of Trade J.), 1904, 2, 89.

THE sample, which had been gathered from plants several years old, the cultivation of which had been neglected, had a length of staple of 1·2—1·5 ins. The cotton was silky, but irregular, and inferior to American "Sea Island" cotton. It is estimated as worth about 7½d. per lb.—A. S.

Hemp, Sisal (Agave Rigida, var. Sisalana), from South Australia. Bull. Imp. Inst. (Suppl. to Board of Trade J.), 1904, 2, 88.

THE specimen examined consisted of white, fairly strong fibre, with a staple of average length, 40 ins. It is valued at 35l.—38l. per ton on the London market. The results of the chemical examination of the sample, together with those obtained with specimens of Sisal hemp from other British Colonies, are given in the following table:—

Source of Fibre.	Moisture.	Ash.	Cellulose.
	Per Cent.	Per Cent.	Per Cent.
South Australia.....	8·8	0·7	79·1
Bahamas.....	12·8	4·4	75·9
Trinidad.....	11·6	1·0	77·2
New South Wales.....	9·8	1·6	77·7
India (Saharanpur).....	9·1	0·8	82·4

—A. S.

Fibre of Furcraea Gigantea from British Central Africa.
Bull. Imp. Inst. (Suppl. to Board of Trade J.), 1904, 2, 84.

Furcraea gigantea, the plant from which Mauritius hemp is derived, has been found to grow well in British Central Africa. The specimen of the fibre examined was fairly white in colour, and had a staple about 40 ins. in length. In the following table the results of the chemical examination of the fibre are given, together with those obtained with specimens of the same fibre from S. India, Grenada, and Victoria:—

	B.C.A. Specimen.	S. Indian Specimen.	Grenada Specimen.	Victoria Specimen.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Moisture.....	8·7	9·8	10·2	11·6
Ash.....	1·1	..	2·4	2·3
Loss on (a) hydro- lysis.....	10·0	12·4	14·9	13·0
Loss on (b) hydro- lysis.....	14·5	14·5	22·0	23·5
Loss on acid purifi- cation.....	1·7	1·7	3·8	5·6
Loss on mercerisa- tion.....	8·7	11·4	16·0	16·2
Gain on nitration...	38·1	40·7	34·0	34·0
Cellulose.....	75·8	77·7	77·8	72·2
Length of ultimate fibre in mm. }	2-5 (aver. 3·5)	2-5	1-5	1-3

The specimen examined closely resembles that from Southern India, and is distinctly superior to those from Grenada and Victoria. It is estimated as worth from 26l. to 30l. per ton.—A. S.

Hemp, Mauritius (Furcraea Gigantea), from South Australia. Bull. Imp. Inst. (Suppl. to Board of Trade J.), 1904, 2, 89.

THE specimen consisted of a very long fibre (staple, 5 ft.), but of poor colour, roughly prepared and weak. It is said to be worth 28l. to 30l. per ton. It contained 8· per cent. of moisture, 1·4 per cent. of ash, and 74·5 per cent. of cellulose.—A. S.

Hemp, Boesstring (Sansevieria Zeylanica), from South Australia. Bull. Imp. Inst. (Suppl. to Board of Trade J.), 1904, 2, 88—89.

THE sample consisted of a soft, fine fibre, somewhat deficient in strength, and with an average length of 38 ins

It is estimated as worth from 33l. to 35l. per ton. On analysis, the sample gave the following results, the figures obtained with specimens of the fibre from other sources, being also given for the purpose of comparison:—

Source of Fibre.	Moisture.	Ash.	Cellulose.
	Per Cent.	Per Cent.	Per Cent.
South Australia.....	8·1	0·4	80·9
Assam.....	9·4	0·7	75·6
Grenada.....	9·5	1·4	72·7
Straits Settlements.....	9·9	0·7	75·9

—A. S.

ENGLISH PATENTS.

Viscose; Manufacture or Treatment of Threads or Filaments from —. C. H. Stearn, London, and C. F. Topham, Kew. Eng. Pat. 16,604, July 28, 1903.

THREADS of viscose, after passing through the bath of ammonium salt solution, and before spinning, are treated with a solution of an iron salt or other salt which produces an insoluble sulphide with alkali sulphide (e.g., a 10 per cent. solution of ferrous sulphate). This removal of ammonium sulphide and polysulphide prevents the fibres from adhering together when spun and becoming stiff.—T. F. B.

Colouring, Decorating, or Printing Textile and other Fabrics, Paper, and other Materials; Process for —. C. L. Burdick, London, and H. Pervilhac, Villeurbanne, France. Eng. Pat. 14,472, June 29, 1903.

SEE Fr. Pat. 334,667 of 1903; this J., 1904, 185.—T. F. B.

UNITED STATES PATENTS.

Dyeing, &c.; Apparatus for —. J. Schmitt, Danjoutin-Belfort, France. U.S. Pat. 764,825, July 12, 1904.

SEE Eng. Pat. 6591 of 1901; this J., 1901, 718.—T. F. B.

Dyeing; Apparatus for —. O. Venter, Chemnitz, Germany. U.S. Pat. 764,966, July 12, 1904.

SEE Eng. Pat. 23,055 of 1901; this J., 1902, 340.—T. F. B.

VII.—ACIDS, ALKALIS, AND SALTS.

Alkali, &c. Works; Fortieth Annual Report on —, by the Chief Inspector. Feb. 17, 1904.

THE Alkali, &c. Works Bill of 1903, to amend and consolidate previous Acts, was read a first time in the session of 1903. It was proposed in this Bill to include, though in a very limited manner, certain smelting or metallurgical works within its scope; but in the Bill of 1904, recently introduced, the clauses relating to these have been withdrawn, as, if included, it became evident that opposition causing delay would be made. But amendments of certain clauses of the 1903 measure are included, which have been agreed upon with the trades affected.

Alkali and wet copper works, these being the longest under inspection, have given "little ground for complaint" in the past year. Complaints of damage done continued to be received from Widnes in 1903, but in this district there are metallurgical works not within the jurisdiction of the Alkali Acts, with which works the responsibility must be shared.

In alkali waste works, attention continues to be directed to the acid discharges from the chimneys to which, "after combustion to sulphurous acid in special coal-fired furnaces, the residual mixture of fine sulphur, sulphuretted hydrogen, and sulphurous acid is draughted." The chief inspector at first suggested the use of a spray of alkaline magma (carbonated spent waste) thrown up to meet the residual gases; but such waste proved to be too crystalline to be a good absorber, and to be apt to clog the passages. An experimental plant was set up by Mr. Murphey, co-operating with Dr. Affleck, in which a constant flow of milk of waste, rendered alkaline either by (1) milk of lime; or (2) by carbonated spent waste (discharged from the Chance

carbonators), ran down two boiler fire-flues set up on end, in tandem, in which sloping shelves were fixed, extending to half the diameter of the flue. In order to interpret rationally the results obtained, Mr. Linder undertook a laboratory investigation "to determine the conditions most favourable for the complete absorption of hydrogen sulphide and sulphur dioxide by 'waste' slurry, either alone or in conjunction with added lime." The questions to be answered were: (1) Nature of the interaction of hydrogen sulphide and sulphur dioxide in presence of varying amounts of calcium hydroxide. (2) Nature of the interaction of hydrogen sulphide and sulphur dioxide in presence of tank waste suspended in water. In respect to (1), calcium sulphide gave no reaction with calcium sulphite in presence of excess of lime. Calcium hydrosulphide and calcium bisulphite yielded mainly calcium thiosulphate. Calcium sulphide and hydrosulphide with calcium bisulphite, in presence of free sulphurous acid, gave calcium thiosulphate, free sulphur, and sulphur in other forms, but the reacting proportions are always S as H_2S : S as SO_2 : 44 : 56. It appears, therefore, that if loss of sulphur as thiosulphate or free sulphur is to be avoided, the presence of free sulphurous acid or bisulphite should be excluded. In respect to (2), the action of hydrogen sulphide and sulphur dioxide upon "waste slurry" at 60° F., the experiments which were made with (a) hydrogen sulphide alone; (b) sulphur dioxide alone; and (c) hydrogen sulphide and sulphur dioxide together, lead to the following conclusions:—(a) The free base in solution as hydrate or carbonate reacts with the added hydrogen sulphide and sulphur dioxide to form soluble hydrosulphide or insoluble sulphite respectively. (b) The sulphurous acid reacts with insoluble calcium sulphide—(i.) Local, $2H_2SO_3 + CaS = H_2S + Ca(SO_3H)_2$; (ii.) General, $H_2SO_3 + CaS = H_2S + CaSO_3$. (c) The sulphuretted hydrogen added, and that liberated by reactions (b) reacts with insoluble calcium sulphide, $H_2S + CaS = Ca(SH)_2$. (d) Calcium bisulphite and calcium hydrosulphide react locally to form thiosulphate, $2Ca(SO_3H)_2 + Ca(SH)_2 = 3CaSO_3 + 3H_2O$. Applying these equations to calculate the theoretical yield of hydrosulphide, figures are obtained which agree well with experiment." Details of the results obtained are given in two tables.

At wet copper works, more difficulty is experienced than in alkali works generally, in keeping the hydrochloric acid gas evolved within due limits, partly because it has not proved convenient to construct the furnaces on the plus-pressure principle, as usually the case. Dr. Affleck reports that by a plan of burning a certain proportion of "pyrites smalls" in a special furnace apart, at certain intervals, and mingling the gases with those derived from the other furnaces, in which the mixture of burnt copper ore with salt is calcined, all excess of chlorine in these gases is reduced, obviating the difficulty in absorption which otherwise arises. It is stated that at a factory in which one chimney draws from 20 or more furnaces, the adoption of this method has rendered air dilution, as formerly practised, unnecessary, in order to keep within the requirements of the Act.

The works in which sulphuric acid is made by the chamber process have given no grounds for complaint in respect to escape of acid gases in the past year. Of the contact process, two examples, on different systems, are now operating in England, and a factory also exists in Scotland. These English works have been the occasion of some trouble, due to defects of design and construction. The chief inspector recommends, for the reduction of the escape of acid, when its recovery is not desired, a limestone tower, fed with water, such as has been successfully employed in the Venetian red manufacture. In respect to the Scotch factory (using the contact process), the chief inspector regrets that not much progress has been made in reducing the escape of acid gases; but trials are being made of a new design, from which better results are expected. The bottom inlet to vitriol chambers, of which Mr. Porter showed a glass model before the Society of Chemical Industry at Manchester, in April 1903, (this J., 1903, 477), has been adopted at several works, and an experimental trial of the method at one works has shown a yield of acid in the entire plant "7.0 per cent. higher with the bottom inlet to the chamber, than with the old flues, and there was also

found to be a saving of nitre just on 1.0 per cent." Other advantages accruing from the adoption of the method are also mentioned.

Many firms have to purify their sulphuric acid from arsenic by means of hydrogen sulphide, and at present the sulphide mud is consigned to the nearest tip; but it is hoped that some method of utilising it may be found. An analysis by Mr. Fryer shows that the mud contains, besides its main constituents (arsenious sulphide and free sulphur), sulphuric acid and water, appreciable proportions of antimonious, lead, bismuth, and copper sulphides, besides calcium and ferrous sulphates.

In the concentration and rectification of sulphuric acid, "the overheat pan has not yet been replaced" by a method "yielding more satisfactory results in lessened escape of acid gases." The Kessler system has received further extension, though not unattended by complaints on the starting of new plant; but improved results are expected. The advantages arising from the exclusion, as far as possible, of air and permanent gases from the vapour to be condensed, previously pointed out by the chief inspector, are increasingly recognised. The best results are obtained where platinum stills with platinum covers are used, next to which in efficiency comes the Faure-Kessler combined platinum and lead apparatus. In making acidimetric estimations, the chief inspector emphasises the precautions necessary to be observed. In using phenolphthalein and methyl orange as indicators, it is to be noted that the former gives an erroneous result unless it is titrated at a boiling heat, owing to the action of carbonic acid; and it is pointed out that 1 cb. ft. of air at 60° F. contains carbon dioxide equivalent to 0.59 grain of sulphuric anhydride. When an alkaline absorbent of residual acid gases is used, the conditions are favourable for retention of the carbon dioxide. In exits of chambers using pyrites, or the gases of sulphate of ammonia saturators, or spent oxide from gas works, as the source of sulphur, the proportion of carbon dioxide is increased for reasons that are explained. The chief inspector writes, "as regards the critical comparison of various absorbents, it is absolutely essential that concurrent aspirations should be made, if it is desired to draw any conclusion with certainty as to the efficiency of any particular absorbent. Conditions vary, from time to time, with such rapidity in the chamber process that only in this way is it possible to proceed to obtain results of permanent value." The manufacture of chemical manures has been conducted in increased volume in the past year. Dr. Affleck's method of testing the acid gases escaping from the final exit flues in the manufactures described in the preceding report (see this J., 1903, 863) has been adopted generally, accuracy being thereby secured. The following table shows the amount of manure materials, in tons, imported during the years indicated:—

	1903.	1902.	1901.
Guano.....	28,000	9,000	13,000
Mineral phosphates.....	392,714	365,000	354,910
Nitrate of soda.....	115,000	105,000	107,800

The exports of sulphate of ammonia were 162,300 tons in 1903, as compared with a home consumption of 71,700, inclusive, for all purposes. For 1902, the corresponding figures were 162,750 tons and 63,750 tons respectively. Mond producer-gas plants, fitted for the recovery of ammonia, have been introduced for the first time in Scotland, and in 1904 a further increase in them is looked for, as well as further extension of coke-oven plants with recovery of residuals. The tendency for gasworks to work up their own residual products is on the increase. The chief inspector directs attention to certain sources of loss of ammonia in the saturators, one of which is the construction of saturators with too steep an angle in the bottom from back to front, so that after the sulphate formed has been fished out, the ammonia-distributing pipe tends to become unsealed; losses also occur through gradual enlargement of the holes in the pipe.

*Amount of Sulphate of Ammonia produced in the
United Kingdom.*

	1903.	1902.	1901.
Gas works	149,489	150,055	142,703
Iron works	19,119	18,801	16,383
Shale works	37,353	36,931	40,011
Coke-oven works	17,438	15,352	12,255
Producer-gas and carbonising works (bone and coal)	10,265	8,177	5,891
Total	233,664	220,316	217,213

Mr. Linder, at the request of the Chief Inspector, gives "Analyses of Ammoniacal Liquors from various Sources, and Review of the Methods employed in Determining the various Sulphur Compounds," in which he details the methods adopted for the determination of ammonia, free and fixed; carbonic acid; chloride; sulphur, under (a) as sulphate; (b) as thiocyanate (sulphocyanide); (c) as sulphide, sulphite, and thiosulphate; (d) total sulphur; (e) sulphur as polysulphide. Under the heading "Estimation of Sulphate in Ammoniacal Liquors," three methods are described, consisting in: (1) differentiation of sulphite and thiosulphate by oxidation with a current of air; (2) precipitation of the sulphite by baryta water; (3) polysulphide method, for which the results are given in tabular form. Other headings are: Estimation of Total Sulphur in Ammoniacal Liquors; Distribution of Sulphur in Ammoniacal Liquors; and Estimation of Cyanide in Ammoniacal Liquors.

The total output of rock salt, white salt, and salt contained in brine used for making alkali by the ammonia-soda process, was, in 1902, 1,893,881 tons, the output for the preceding year having been 1,783,056 tons. Most of the increase was due to the works in Cheshire and Stafford. In cement works, there is continued extension of methods depending on the continuous feed of materials and discharge of calcined cement by the use of rotary cylindrical kilns. Difficulties in reference to the occurrence of black smoke have not been wholly overcome. All the works of the Associated Portland Cement Manufacturers, 1900, Ltd., have been provided with cylinders of compressed oxygen, with mouthpieces, for use in cases of poisoning by kiln gases. It has been suggested to other owners and managers of cement works to adopt similar precautions. The production of arsenic has fallen from 3,361 tons in 1901 to 2,131 tons in 1902. No fault is found with the works. A new Venetian red work has been established in South Wales.

In respect to the conduct of tar works, the Home Office has issued draft rules calling attention to the risks to workmen who are engaged in carrying on the various operations of the process, in harmony with the chief inspector's previous warnings, as to isolation of stills during the process of chipping out and cleaning. In "Studies on the Claus Kiln Reaction," the substance of much of the paper by the chief inspector and Mr. Linder, published in this Journal for March, 1903, 457-465, is reproduced, with the results of experiments made since that date. The examples given in the 39th Report of the theoretical maximum heat of reaction were confined to the Scotch works, but have now been extended to the English works. According to the hypothesis examined, the maximum arrived at lies between 946° and 1035° F. There is evidence that at the top of the Claus kiln, owing to the intensity of chemical reaction in this space, temperature is very high, causing much injury to the wrought-iron top. It is anticipated that Dr. Affleck will continue experiments at an experimental Claus kiln to further elucidate this point. The chief inspector gives, in an appendix to the above-mentioned "Studies," detailed calculations showing that the governing factor for conditions for the reversing action, $3S + 2H_2O = 2H_2S + SO_2$ (the other reaction being $H_2S + O = H_2O + S$), is the large amount of heat required to vaporise the sulphur.

The Claus kiln reaction studies are grouped under the following heads:—(A.) The Heat reactions, theoretically considered, of different Gaseous Mixtures, with tabular

matter. (B.) Experiments with Manganese Oxides as Contact Material in place of Ferric Oxide, in respect to which it is stated that "while, in the Claus kiln, ferric oxide is converted into iron bisulphide, manganite of manganese and manganite of calcium are converted into manganous and calcium sulphates. The stage of manganous sulphide appears to be of very temporary duration; no trace of this could be found. The manganous sulphate is in the form of monohydrate." (C.) Determination of the "Efficiency" of the Claus Kiln and Chambers, with remarks upon the measurement of gaseous volumes, and methods applicable to exit gases. Under this heading, several tables of results are given, partly derived from experiments (by Mr. Linder) with the Leicester Corporation, and South Metropolitan Gas Company's Claus plant, supplemented by tests from other works. (D.) Ammonia in Recovered Sulphur from Claus kilns attached to Gas Liquor Processes. Under this heading the results of experiments on the reaction of steam upon hydrocyanic acid at from 500°-600° C. are given. (E.) Appendix, giving thermal calculations and discussions, with numerous experiments, and calculations relating to the air supply in treating saturator gases; and on the volume of reacting mixture entering, to that of the exit gases. Mr. Sutton (Eastern and South Eastern Counties District) writes: "The presence of considerable quantities of ammonia salts in the recovered sulphur from the Claus process has frequently been observed. These were generally attributed to ammonia having passed by the saturators; but during a recent investigation of the working efficiency of certain contact material used in a Claus kiln and the reactions taking place therein, it was found that cyanogen compounds passing forward to the kiln with the saturator gases were converted into ammonia compounds. This interesting reaction is receiving further investigation." Combustion of foul saturator gases in a special furnace, with subsequent neutralisation of the resulting sulphurous acid, has received further extension in several works; whereas their passage to the hydraulic or crude gas main of coal-carbonising plant is less adopted. The practice of passing such gases to the retort or boiler fire flues is still in use, but is considered to be legitimate only at the smallest works.

A curious statement is made respecting the heaps of alkali waste about the Netham Chemical Works, at Bristol. On these, for years no blade of grass or weed grew; but now, the narrow-leaved wall mustard (*Diplotaxis tenuifolia*) is "fast spreading its verdure over these arid heaps of chemical refuse." The plant occurs in the south, south-west, and east of England, but in other parts is rare or absent. It bears pale yellow flowers with an almond-like fragrance. It is suggested that, on aesthetic grounds, it might be worth while to encourage the growth of this plant on other such unsightly heaps besides those of Bristol. There was one prosecution in the year covered by the Report, for infractions of the provisions of the Act of 1881 in the manufacture of chemical manure. The Report contains 183 pages, of which 13 pages are devoted to Scotland.

—E. S.

Electrolysis of Alkali Chlorides by the "Bell Process."

G. Adolph. Z. Elektrochem., 1904, 9, 449-450.

The author claims priority for the experimental foundations of a theoretical explanation of the continuous function of this process, as recently dealt with by O. Steiner (this J., 1904, 545); he considers that the experiments of the latter confirm, rather than contradict, his previous work.

—R. S. H.

Potassium Metabisulphite and Sodium Bisulphite; Alteration of — when Exposed to Air. A. and L. Lumière and A. Seyewetz. XXI., page 799.

Cyanogen and Cyanides; Slow Oxidation of — by Free Oxygen. Berthelot. Comptes rend., 1904, 139, 169-177.

ALKALI cyanides, cyanogen, and hydrocyanic acid, in aqueous and alcoholic solutions, all absorb free oxygen slowly; the absorption is accelerated by sunlight and also by rise in temperature. The absorption is most marked in the case of potassium cyanide, and most feeble with hydrocyanic acid. When the absorption is carried out over

mercury, small quantities of the metal are dissolved; when the oxidation of potassium cyanide was performed in alcoholic solution, over mercury, and in presence of potassium hydroxide, no solution of the mercury was found to occur.—T. F. B.

ENGLISH PATENTS.

Nitrous Anhydride and Nitrites; Manufacture of —. H. E. Newton, London. From Farbenfabr. vorm. F. Bayer & Co., Elberfeld, Germany. Eng. Pat. 18,594, Aug. 28, 1903.

SEE Fr. Pat. 336,329 of 1903; this J., 1904, 186.—T. F. B.

Dicalcium Phosphate; Method of Producing —. E. Bergmann, Ohlau, Germany. Eng. Pat. 19,267, Sept. 7, 1903.

SEE Fr. Pat. 335,798 of 1903; this J., 1904, 253.—T. F. B.

Alkaline Prussiates; Manufacture of —. G. E. Davis, Knutsford, Cheshire. Eng. Pat. 20,069, Sept. 17, 1903.

In the process for the manufacture of alkali prussiates from coal gas scrubbing described in Eng. Pat. 26,566 of 1902 (this J., 1903, 1243), it is found to be necessary to use an excess of sodium carbonate over that needed to form sodium prussiate and to displace ammonia in the mixture of liquids and solids coming from the scrubber, and this excess becomes concentrated in the mother liquor remaining after the crystallisation. The present invention consists in adding lime to the mother liquor, and using the caustic filtered solution for introduction to the still for the conversion of the sodium-ferrous-ferrocyanide into sodium prussiate, as described in the cited patent.—E. S.

Gypsum; Manufacture of Crystalline —, applicable for Filling Purposes. W. Brothers, Prestwich, Lancashire. Eng. Pat. 26,007, Nov. 29, 1903.

SEE Fr. Pat. 333,858 of 1903; this J., 1904, 20.—T. F. B.

Nitrogen and Oxygen; Apparatus for the Separation of — from Atmospheric Air. J. Price, London. Eng. Pat. 14,213, June 27, 1903.

The process consists in the known process for the use of barium oxide or the like; but in such manner as to be continuously carried out. The apparatus includes the combination with a suitably heated retort, of means for receiving air and for discharging separated gases; of a partition carried by a spindle mounted on bearings in the retort, capable of being turned in either direction to establish or cut off communication between the oxygen and nitrogen chambers defined by the partition; and trays to contain the absorbing material, arranged in connection with the spindle, and to be moved out of one chamber into the other simultaneously with the movement of the partition. In another form of apparatus, also giving a continuous process of separation, means are provided for moving the receptacles containing the absorbing medium from one chamber to another, to effect peroxidation and deoxidation.—E. S.

UNITED STATES PATENTS.

Nitrous Anhydride and Nitrites; Process of Making. H. von Kéler, Leverkusen, Germany, Assignor to Farbenfabriken of Elberfeld Co., New York. U.S. Pat. 763,491, June 28, 1904.

A mixture of ammonia with air or oxygen in excess is passed over an oxide of a heavy metal (iron oxide for instance), or over a mixture of such oxides, kept at a temperature between 650° and 750° C. to obtain nitrous anhydride. When it is desired to form a nitrite, the effluent gases, containing "nitrous anhydride," are brought into contact with an alkali hydroxide or carbonate.—E. S.

Hydrocyanic Acid; Process of Making —. W. Feld, Hönningen-on-the-Rhine, Germany. U.S. Pat. 764,443, July 5, 1904.

SEE addition, of Aug. 30, 1902, to Fr. Pat. 315,837 of 1901; this J., 1903, 671.—T. F. B.

Ammonium Nitrate of; Process of Producing —. F. Naumann, Cologne, Germany. U.S. Pat. 764,251, July 5, 1904.

SEE Fr. Pat. 339,733 of 1904; this J., 1904, 714.—T. F. B.

Copper Sulphate; Process of Making —. G. Gin, Paris. U.S. Pat. 765,000, July 12, 1904.

SEE Eng. Pat. 5230 of 1903; this J., 1904, 323.—T. F. B.

Acid of Proof Composition. F. A. Pank. U.S. Pat. 763,421, 1904. IX., page 788.

FRENCH PATENTS.

Phosphoric Acid; Producing —, by Means of Aluminium Phosphate and other Substances. Brandon Frères. Fr. Pat. 340,272, Feb. 9, 1904.

ALUMINIUM phosphate (especially the natural phosphate), which may be mixed with coal dust, is heated in a suitable retort, connected to condensing apparatus and an exhausting pump, to a temperature not exceeding 800° C. It is stated that on maintaining a vacuum (say from 6 to 50 mm. of mercury) in the retort by use of the pump, the heated phosphate gives off fumes which condense in water, mainly to metaphosphoric acid, mixed with small proportions of orthophosphoric, hypophosphoric, and hypophosphorous acids. The vapours not absorbed by water are passed through alkaline solutions.—E. S.

Oxygen; Simplified Preparation of —. G. F. Jaubert. Fr. Pat. 340,388, Feb. 12, 1904.

THE process is one of preparing oxygen by the action of water on alkali peroxides, &c. The peroxides are contained in hermetically soldered tin boxes, preferably in packets or pieces separated from one another by suitable bands or metal strips. A box thus charged is provided with an opening in its upper side, closed by a screw stopper, and another, but perforated stopper, is provided, adjusted to the same thread, having a rubber tube attached, connecting it to a reservoir. A pin hole is made in the under side of the box, which, fitted to the discharge tube, is completely immersed in water. As the water slowly enters, oxygen is formed and is collected. Compare Fr. Pat. 325,627 of 1902, and Add. to the same, this J. 1903, 743 and 1346, and Fr. Pat. 336,062 of 1903; this J., 1904, 328.—E. S.

VIII.—GLASS, POTTERY, ENAMELS.

Ceramic Body; New —. M. Buchner. Z. angew. Chem., 1904, 17, 985—988.

It is found that the artificial corundum, obtained as a by-product of the Goldschmidt aluminothermal process (this J., 1898, 1151), is capable of imparting to kaolin, clay, and other ceramic bodies (for stoneware in particular), the property of resisting extreme fluctuations of temperature, owing to the fact that it almost entirely eliminates the element of contraction in these bodies. Sherds containing corundum as an ingredient may be heated to whiteness in the oxyhydrogen blowpipe flame and immediately plunged into water without fracture. They also possess a high tensile strength (e.g., 61·2 kilos. per sq. cm.), with a total extensibility of 0·0149 (permanent 0·0019, elastic 0·012) per cent. With ordinary stoneware of corresponding quality, these values are about 44 kilos., and 0·0097 (permanent 0·0002, elastic 0·0095) per cent. respectively. The crushing strength of the corundum ware is 1725 to 2685 kilos. per sq. cm., as compared with 800—1300 kilos. in the case of ordinary stoneware. The ware is acid-proof, and can be made up in the form of porous diaphragms for electrolytic purposes; whilst the absence of shrinkage is considered to specially fit it for these uses.—C. S.

FRENCH PATENT.

Glass; Process for Working —. H. J. Hays. Fr. Pat. 340,920, March 3, 1904.

SEE Eng. Pat. 4501 of 1901; this J., 1904, 546.—T. F. B.

IX.—BUILDING MATERIALS, CLAYS, MORTARS AND CEMENTS.

ENGLISH PATENTS.

Fireproofing Compounds [for Wood] and the Art of Making the same. J. L. Ferrell, Philadelphia, U.S.A. Eng. Pat. 18,090, Aug. 21, 1903.

SEE Fr. Pat. 335,054 of 1903; this J., 1904, 116.—T. F. B.

Fireproofing Compounds [for Wood] and the Art of Making the same. J. L. Ferrell, Philadelphia, U.S.A. Eng. Pat. 18,092, Aug. 21, 1903.

SEE Fr. Pat. 335,055 of 1903; this J., 1904, 116.—T. F. B.

Cement from Slag; Process for Manufacturing — C. von. Forell, Hamburg. Eng. Pat. 218, Jan. 4, 1904.

SEE Fr. Pat. 339,316 of 1904; this J., 1904, 663.—T. F. B.

UNITED STATES PATENTS.

Acid-Proof Composition. F. A. Pank, Butte, Mont., U.S.A. U.S. Pat. 763,421, June 28, 1904.

A MIXTURE of linseed oil, india-rubber, rosin, beeswax, silica, red lead, and gypsum, specified proportions of which are these:—1 gall. of linseed oil; 8 oz. of india-rubber; 4 oz. of rosin; 10 oz. of beeswax; 3 lb. of silica; 2 lb. of red lead; and 3 lb. of gypsum.—C. A. M.

Cement; Process of Manufacturing — G. Geissler and G. Geissler, jun., Gratz, Austria-Hungary. U.S. Pat. 764,453, July 5, 1904.

SEE Eng. Pat. 9835 of 1903; this J., 1903, 868.—T. F. B.

FRENCH PATENTS.

Bricks; Process for Covering — with a Protective Coating to prevent Efflorescence and Blackening. M. Perkiewicz. Second Addition, dated Feb. 10, 1904, to Fr. Pat. 330,655, March 27, 1902.

SEE Eng. Pat. 3760 of 1904; this J., 1904, 662.—T. F. B.

Refractory Products; Process for Making Extremely — J. Bach. Addition, dated Feb. 12, 1904, to Fr. Pat. 336,518, Nov. 10, 1903.

SEE Eng. Pat. 4478 of 1904; this J., 1904, 607.—T. F. B.

Lithographic Stones; Manufacture of Plates suitable for Use as Substitutes for — G. Bower and W. Gauntlett. Fr. Pat. 340,445, Feb. 15, 1904. Under Internat. Conv., March 17, 1903.

SEE Eng. Pat. 6155 of 1903; this J., 1904, 325.—T. F. B.

Adhesive Substance [Cement]; Process of Making an — L. Weiss. Fr. Pat. 340,754, Feb. 27, 1904.

SEE Eng. Pat. 4939 of 1904; this J., 1904, 607.—T. F. B.

X.—METALLURGY.

Metals; Hard and Soft States in — G. T. Beilby. Electro-Chem. and Metall., 1904, 3, 806—819.

THE author brings forward a new theory of the hardening of metals by plastic flow based on the results of a study of the microstructure of metal and other surfaces (this J., 1903, 1107, 1108), and, in particular, the discovery of surface flow during the polishing of crystalline solids (this J., 1901, 922; 1903, 1166). According to the theory metals occur ordinarily in two distinct phases: the hardened or amorphous (A), and the annealed or crystalline (C) phase. The A phase is transformed into the C phase by the agency of heat, the C phase is transformed into the A phase by mechanically produced flow. In the transformations $A \rightleftharpoons C$ there are two intermediate mobile phases, M and M', so that the transformations may be written $A \rightarrow M' \rightarrow C$ and $C \rightarrow M \rightarrow A$. Evidence in favour of the theory is furnished by:—(1) The distinct mechanical properties of the two phases A and C. (2) The microstructure of these and the indications which it supplies of the existence of the mobile phases M' and M. (3) The

optical properties, (4) the electrical properties, and (5) the thermochemical properties of the phases A and C.

Mechanical Properties—When silver is rolled, hammered, or wire-drawn, its hardness and tenacity are raised to a very high point. For instance, the tensile strength of soft silver may, in this way, be raised from under 10 tons to over 20 tons per square inch. A strip of silver made quite hard and springy by hammering will, after heating to 260° C., become so soft that it may be pressed perfectly flat on a smooth surface by the slightest pressure from the finger.

Microstructure—Annealed silver, if in a sufficiently massive form, always shows a crystalline microstructure, consisting of skeletons or grains built up of lamellæ of similarly oriented units. The microstructure of hardened silver is vitreous-looking on the surface, and finely granular immediately below the surface. By careful treatment with a solvent, the glassy surface and the granular portion immediately below can be completely removed, disclosing the crystalline grains or skeletons of the C phase more or less deformed or broken up. The vitreous layer with granules thickly distributed throughout its mass, always appears at surfaces of flow, the granules probably being produced by the breaking down of the lamellæ and the setting free of the units of which they are built up. The persistence of the units of the C phase in the granules may be due to their being encased in an envelope of the hardened A phase.

Optical Properties—Hardened silver, even in its moderately attenuated forms, such as beaten leaves and deposited films, is highly reflecting and only slightly translucent. By heating to 250°—300° C., the leaf or film becomes transparent and loses much of its reflecting quality, but opacity and reflecting power are restored by "flowing" or burnishing the annealed leaf or film.

Electrical Properties—Silver wire in the annealed state has an electrical conductivity 8—10 times higher than that of the same wire in the hardened state. A thermo-junction consisting of a hardened and an annealed silver wire has an E.M.F. of 0.17 micro-volt for 1° C. of difference between the hot and cold junctions. At 260° C. the E.M.F. falls to zero, as the hardened wire then passes into the soft condition. Copper, iron, platinum, and magnesium all show a measurable E.M.F. between the two states.

Thermochemical Properties—In etching polished or hardened silver, the solvent acts first on the hardened phase, leaving the crystalline phase exposed, whereas if the hardened metal were merely a slightly compacted form of the annealed, the latter more open form would be more readily attacked and dissolved.

The author discusses the application of his theory to the deformation of the crystalline structure of metals by overstrain as observed by Ewing and Rosenbain (this J., 1899, 834; 1900, 1115), the increase in the tensile strength of a metal produced by drawing it through a die, the hardening of iron by thermal treatment and the mechanical action of gases in this respect (see this J., 1901, 1212), and the breaking down of the tenacity and elasticity of metals under frequent repetitions or reversals of stress. The great inferiority of a wire which has been hardened by stretching as regards tenacity to one which has been hardened by drawing through a die, is due to a difference in the structural disposition of the two phases in the hardened metal. In the stretched wire the surface layer during stretching must be alternately made and broken many times, and is finally left rough and open. In drawing on the other hand, the flow of the surface as the wire is leaving the die, ensures that it is strong and unbroken.

Spathic Iron Ore; Calcination of — C. Lacoisne. Bull. Soc. d'Encourag., 1904, 106, 360.

THE spathic ores of Western Hungary and Austrian Silesia contain 35 per cent. of iron or less, and are usually calcined so as to lessen the cost of transport. The furnaces, lined with ordinary brick and cased in sheet iron, hold about 60 tons, and calcine about 15 tons per 24 hours. Alternate layers of ore (3½ tons) and coke (210 kilos.) are charged; and a tube of 25 mm. diameter passes down the centre of the furnace, through lateral holes in which fine jets of water

under pressure are injected horizontally into the furnace. The reaction of this upon the hot coke, and the subsequent combustion of the hydrogen and carbon monoxide produced, favour the calcination, so that a saving of half the fuel (from 12 to 6 per cent.) formerly used has been effected.—J. T. D.

Tool-Steels; Rapid — H. le Chatelier. Bull. Soc. d'Encourag., 1904, 106, 334—347.

THE author gives the following analyses of rapid tool steels:—

No.	Carbon.	Silicon.	Manganese.	Tungsten.	Chromium.
1	0.71	0.20	0.30	12.0	3.0
2	0.43	0.22	0.17	15.5	4.5
3	0.45	0.16	0.02	13.0	1.6
4	0.45	0.60	0.18	9.5	2.05
5	0.30	0.40	0.30	13.5	8.0
6	0.30	0.25	0.18	7.0	2.1
7	0.65	0.80	0.12	0.4	3.6

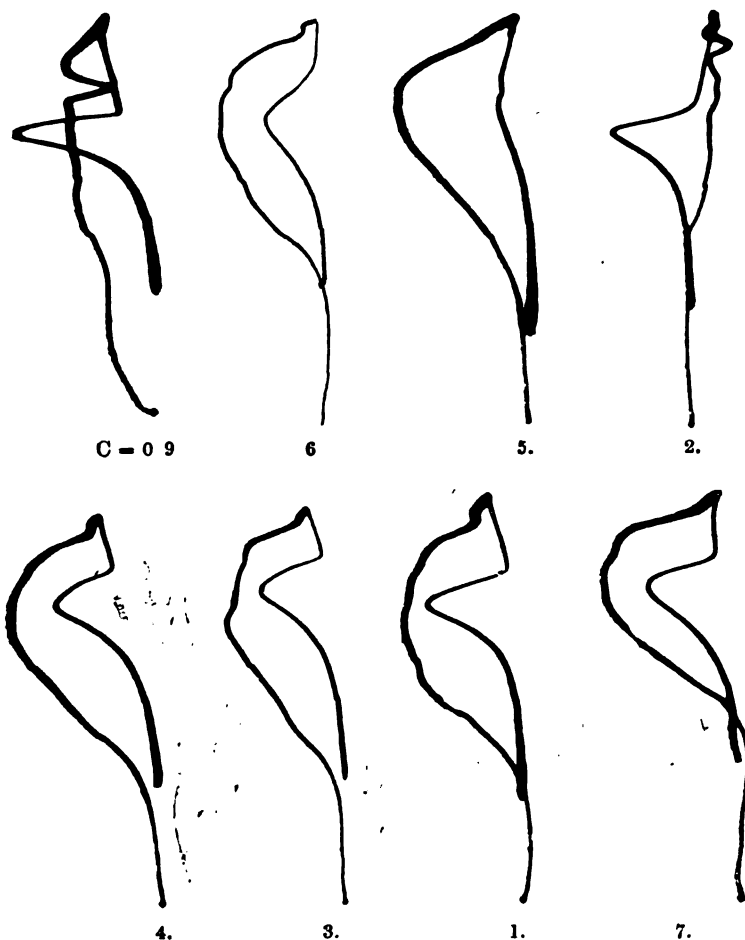
We may take the average or typical composition to be:—carbon 0.5, silicon 0.2, manganese 0.2, tungsten 12, chromium 3.0, molybdenum 1, iron 83; but very probably this will be modified in the future, and may revert to the higher carbon and lower tungsten and chromium of the original rapid steels. The points of chief importance in considering the progress made or to be made in rapid steels are as follows:—1. *Net price*: This is high, say 6 frs. per kilo., due to the high prices of vanadium (110), molybdenum (17), and tungsten (7 frs. per kilo.). 2. *Hardness*: This seems to decrease with the carbon, for these steels can be scratched more easily than high carbon tool steels. 3. *Fragility*: Rapid steels are more brittle than carbon

steels; to minimise the inconvenience of this, tools have been made of ordinary steel, with a piece of rapid steel welded on by the oxyacetylene flame to form the cutting edge. Probably careful determinations of the temperature of heating and of the cooling bath would enable a less brittle rapid steel to be produced. An over-heated carbon steel segregates and becomes heterogeneous, and no doubt a rapid steel does the same; and this heterogeneity probably causes brittleness. 4. *Resistance to Tempering*: The temperature of softening is above 500°—600° C., but an hour at 700° C. softens the hardest steel completely. The higher this temperature can be kept the better; for though the average temperature of the tool at work may not reach 500° C., yet the outer portions may be at a much higher temperature. It is to be remembered that the temperature of recalcence is about 700° C., so that as the softening temperature approaches 700° C. there comes a point where softening is impossible. The tempering temperature depends both on the composition of the steel and the initial temperature of heating. A bar with its lower end dipping into water, and heated to fusion at its upper end, then plunged into a zinc-aluminium alloy at 550° C., showed four zones (illustrated in the paper by micro-photographs) indicating, at the bottom, the soft steel unaltered; above, slight softening of the hardened metal on remaining in the bath; above this, perfect temper, homogeneity, with no sign of softening, and at the top hard and brittle steel, heterogeneous in structure. 5. *Cracks*: These form one of the troubles of tempering. They arise from sudden changes of volume, and the liability to them is greatest with high carbon and with a low percentage of tungsten. They have two distinct causes:—a. The state of the metal which is stable at a high temperature is not preserved during the sudden cooling, for the non-magnetic metal becomes

magnetic. This change is accompanied by change of volume, producing cracks; and this effect is the greater, the colder and more brittle the metal is when the change occurs. For this reason the use of metallic baths is advantageous, provided the temperature is not high enough to allow any softening to take place. It is probably to avoid cracks, too, that the carbon has been gradually lessened and the tungsten increased in rapid steels. b. Rapid steels as distinguished from steels in general exhibit another cause of cracks, the same which produces them in glass. A drop of water on the hot steel, for instance, will cause them, hence the recommendation that tools of rapid steel should be sharpened either dry or in a liberal stream of water. In an appendix the author gives the following diagrams showing the points of transformation of the seven steels, the analyses of which are given above, determined by Roberts - Austen's method, using the modified apparatus of M. Saladin, and adds for comparison a similar curve obtained from an ordinary steel with 0.9 per cent. of carbon (see first figure in preceding group). The ordinates measure temperatures, the abscissae differences of temperature between a piece of nickel and the steel under experiment.—J. T. D.

Rapid Steels; Contribution to the Theory of — F. Osmond. Bull. Soc. d'Encourag., 1904, 106, 348—352.

THE specific characters of rapid steels are as follows:—1. The critical points are lowered during the cooling, when the temperature of the previous heating is raised; and if that temperature is above a certain minimum and the metal



is cooled through a sufficient range, it remains self-hardened. 2. Rise of the temperature of heating may cause coalescence of the points Ar 3. 2, and Ar 1, or separation of the multiple point Ar 3. 2. 1. 3. Prolonged heating at a low temperature is equivalent, as far as the position and form of the critical points are concerned, to a shorter heating at a higher temperature. 4. The hardness acquired is more stable during tempering than in the case of carbon steels. The explanation of these characters is found in the following considerations:—1. Suppose a hypereutectoid carbon steel, heated to the point Ac 3. 2. 1, and suppose the homogeneous redistribution of the carbon above the critical point to be instantaneous. The α -iron changes to γ -iron, the carbide of the perlite dissolves and the perlite becomes austenite. If now cooled, the independent cementite plays no part, the content of active carbon is that of the eutectoid—constant and the final state depends on the rate of cooling. Besides the independent cementite, we have, if this rate be infinitely slow, ferrite in grains and extra-granular cementite; complete physico-chemical and structural equilibrium. If ordinary, perlite; physico-chemical equilibrium complete, structural incomplete. If accelerated, sorbite; less complete physico-chemical equilibrium, structural quite incomplete. If rapid, troostite, and if very rapid, martensite; the physico chemical equilibrium more incomplete at each stage. If the heating be continued above Ac 3.2.1, the independent cementite gradually dissolves, and the dissolved carbon increases till a temperature is reached depending on the total carbon; and if the subsequent cooling be rapid enough to impede the segregation of the independent cementite, the final state will depend on the amount of carbon originally dissolved, and as the rapidity of cooling increases we shall have successively—troostite and cementite; martensite and cementite; martensite and austenite. In the austenite, transformation has not begun, and the iron is in the γ -state. 2. Suppose a rapid steel similarly treated. The effect of the chromium and tungsten is to impede the segregation of the cementite, so that, as a first approximation, and within limits, we can neglect the variations in the rate of cooling. Thus, even during slow cooling, the transformation points are lowered further, the greater is the excess of carbon-content at the beginning over that of the eutectoid; and the carbon-content itself depends, directly on the temperature of heating, and indirectly on the chemical composition. By varying the temperature of heating, and thus the content of dissolved carbon, then, we can have as final state, any one of the series, perlite, sorbite, troostite, martensite, austenite, or mixtures of them among themselves and with the cementite in excess. 3. In rapid steels, the hypothesis of the immediate redistribution of the carbon above the critical point does not represent the facts. Its solution is slow, as is the segregation on cooling; they are two sides of one character. Moreover, the cementite is often spherulitic, in separated nuclei, which further retards the solution of the carbon. Thus, unless the heating be very prolonged or the temperature very high, the carbon distribution is not homogeneous, but there are maxima around the cementite nuclei and minima between them. On cooling, each portion behaves independently, and hence a doubling of the recalcence, and a heterogeneous final product, containing always at least two constituents. Usually, recalcence will be single if the temperature has been just above Ac 3.2.1 (for the independent cementite has hardly begun to diffuse) or if it has been very much higher (for the redistributed carbon is homogeneous), and it will be double for intermediate temperatures. 4. If the temperature be raised above the highest temperature spoken of in 3, recalcence may again be double; for partial fusion may separate the metal into two constituents of different carbon-content, which remain distinct during cooling. 5. Chromium, tungsten, &c., lower the eutectoid carbon-content, so that rapid steels are usually hypereutectoid. In the contrary case (or with the hypereutectoid if the cementite be spherulitic) there may be on cooling a point Ar 3.2, independent of Ar 1. 6. The elevation of the temperature of softening in rapid steels is not yet definitely explained; it seems to be another result of the difficulty of segregation of the carbide. Possibly the austenite is transformed into martensite, and thus we get hardening instead of the

softening that occurs in carbon steels. 7. There is no separate theory of rapid steels; the general theory of carbon steels is applicable, if we bear in mind that the solution of carbon during heating and segregation during cooling are rendered difficult by the presence of chromium and tungsten, so that we get, without hardening, all the series of effects which characterise hardening in carbon steels.—J. T. D.

Electrical Resistance of Hardened Carbon Steels; Effect of Reheating on —. Grenet. Bull. Soc. d'Encourag., 1904, 106, 353—357.

BARS of steel (carbon 1.29, manganese 0.07, silicon 0.15, phosphorus 0.006, sulphur, traces) of different sizes and shapes were hardened by heating to varied temperatures, and then cooling in dilute sulphuric acid. Their electrical resistance was determined in this state, and after reheating to varied temperatures for 10 minutes. Moderately energetic hardening exerts no influence on the electric resistance (nor, as Charpy has shown, on the dilatation) of steels, though it acts energetically on their mechanical properties. Reheating, up to 700° C., acts continuously on the mechanical properties of these steels. Very energetic hardening acts on the electric resistance and on the dilatation of these steels, but reheating to 400° C. destroys this effect completely, while it continues to act more and more strongly up to 700° C. on their mechanical properties. Thus, increase of mechanical resistivity and of electrical resistivity, though produced by the same means, do not seem to be due to the same modification of the steel. Cold hammering acts on the mechanical properties of steels similarly to moderate hardening, but it has no effect on the electric resistance.—J. T. D.

Nickel Steels; Effect of Heat Treatment on —. Grenet. Bull. Soc. d'Encourag., 1904, 106, 358—359.

Two samples were examined, containing carbon 0.35, manganese 0.36 and 0.34, nickel 26.9 and 29.0 per cent. respectively, and traces of silicon, phosphorus, and sulphur. Their temperatures of dilatometric transformation were, on heating 510°—540° and 495°—535° C. respectively, and, on cooling below 0° C. Forged and reheated at 925° C., both samples showed the ordinary microscopic characters of non-transformed metal. Forged, reheated at 925° C., cooled to 80° C., and reheated at 550° C., they showed that, after the cooling, part of the metal had been transformed: they were now magnetic; but after reheating they again became non-magnetic, though their microscopic aspect was the same as that of the cooled specimens. Possibly the cooling separates the elements, not of a eutectic, but of a super-saturated solution, and when the transformation-temperature is passed on reheating, only a small proportion of these elements recombine. On heating to 800° the metal recovers the aspect it had before transformation. The steels, heated to 550° C., after having undergone transformation with change of volume at a low temperature, exhibit an increase of tensile strength at the elastic limit, an increase of maximum tensile strength, and a diminution of elongation, as compared with the metals before cooling and reheating. J. T. D.

Iron and Steel; New Process for the Protection of — from Corrosion. S. Cowper-Coles. Electro-Chem. and Metall., 1904, 3, 828—836.

THE iron or steel freed from scale or oxide is placed in a closed air-tight iron receptacle coated on the inside with plumbago and charged with zinc dust. The whole is then heated to 500°—600° F. for a few hours, and allowed to cool. In order to avoid the formation of too much zinc oxide, the air is exhausted from the receptacle before the heating, or about 3 per cent. of carbon in a very fine state of division is added to the zinc dust. The thickness of the coating depends on the temperature and the duration of heating. The process ("Sherardising") can also be applied to the coating of iron with copper, aluminium and antimony, and of aluminium and copper with zinc. Copper and its alloys when subjected to the process are case-hardened, and can indeed be rendered so hard on the surface as to turn the edge of a steel tool. Various advantages are claimed for the process over the ordinary method of hot galvanising. —A. S.

Platinum in Wollastonite, found in Sumatra. L. Hundsdothen. *Inst. Min. & Met.*, July 21, 1904.

THE author describes a deposit of wollastonite associated with garnet (*grossularite*), bornite, gold, and platinum which occurs in old schists near the Singeggoe River, which have been penetrated by granite and subsequently overlaid by augite-diorite and by volcanic rocks. He considers that the present ore-deposit was originally "a layer or big lens" of limestone included within the schists, and that the alteration into wollastonite and garnet has been effected by the intrusion of "apophyses of granite," the introduction of copper, gold, platinum, &c., having been subsequently effected by hot springs. The absence of serpentine and of magnesian compounds generally is remarked upon by the author. A sample of slightly decomposed wollastonite gave 6 grms. of platinum with 4 grms. of gold and 2 grms. of silver per 1,000 kilos. Grains of gold and platinum are found in the river sands below the ore-deposit.—J. H. C.

Platinum and its Deterioration; Some Notes on —. W. Campbell. *Electrochem. Ind.*, 1904, 2, 259–261.

THE chief causes of the deterioration of platinum seem to be its volatility at high temperatures and the fact that heating above 1,000° C. for any length of time causes brittleness. This brittleness may be due to crystallisation, to the formation of compounds, or to the absorption and evolution of gases. The author considers the matter particularly as it affects the use of this metal in resistance thermometers and thermo-couples. The greatest alteration is caused by heating in a reducing atmosphere in presence of siliceous material.—R. S. H.

Lead and Tin; Behaviour of Alloys of — towards Acids. O. Sackur. *Z. Elektrochem.*, 1904, 10, 522–529.

IN determining the equilibrium established when lead-tin alloys are acted on by acidified solutions of lead salts and of tin salts, it is shown (1) that, above 10 per cent., lead is present in the free state, and below 10 per cent. in solid solution; (2) that tin forms solid solutions up to 3 per cent.; and (3) that no chemical compound is formed by the metals. Further, a series of alloys was exposed to the solvent action of dilute acetic acid of various strengths, agitated by a constant supply of air. The lead is directly dissolved, whilst the tin goes into solution secondarily by precipitating an equivalent quantity of lead from the previously formed salt; a coating of pure lead is thus left on the alloy, and from this point onward the sum of lead and tin dissolved is approximately independent of the composition of the alloy. The greater the air supply the more metal goes into solution, but only when the alloy contains above 30 per cent. of lead. Lactic acid dissolves comparatively more tin than acetic acid of the same strength.

—W. A. C.

Metal Substitution. A. J. J. Vandeveldt and C. E. Waeleels. *Bull. Acad. roy. Belg.*, 1904, 331–360. *Chem. Centr.*, 1904, 1, 1629.

THE influence of temperature and concentration on the rate of substitution of copper in aqueous alcoholic sulphate solution by zinc was determined. The experiments were made at temperatures of 24°–25°, 17°–18°, and 7°–8° C., with aqueous alcoholic solutions containing equal amounts of copper sulphate but varying proportions of water and alcohol. In general, increase of temperature caused an increase in the rate of substitution. The initial velocity of reaction is greatest in pure aqueous solutions, and, in aqueous alcoholic solutions, decreases as the proportion of alcohol increases. After some hours, the maximum rate of substitution occurs in aqueous solutions at low temperatures, but in aqueous alcoholic solutions, containing increasing proportions of alcohol, at higher temperatures. The reaction is a double one, being chiefly a simple substitution, with separation of copper, in the first stage, and formation of an insoluble basic zinc sulphate in the second. Low temperature and alcohol retard the metal substitution, but favour the formation of basic salts. The precipitate which separates is a mixture of metallic copper with the basic sulphates

$\text{ZnO} \cdot \text{ZnSO}_4$ and $2\text{ZnO} \cdot \text{ZnSO}_4$. Metallic zinc does not cause separation of basic sulphate from a solution of pure zinc sulphate. (See also this J., 1903, 368, 626).—A. S.

Blast-Furnace Charges; A Graphic Method for the Computation of —. C. O. Bannister. *Inst. Min. and Met.*, July 21, 1904.

THE method proposed by the author is somewhat similar to that devised by H. C. Jenkins (*J. Iron and Steel Inst.*, 1891, 151), but it merely requires a sheet of squared paper, no slide-rule being necessary. The author gives a diagram in illustration of his method. (See also this J., 1892, 821.)
—J. H. C.

Sulphur in Iron; Rapid Method for the Determination of Total — by Evolution. S. S. Knight. *XXIII.*, page 800.

ENGLISH PATENTS.

Iron Sand, whether Natural, or Prepared by Reducing Iron Ore or Iron Wastes; Converting — into Briquettes. T. Rouse and H. Cohn, London. *Eng. Pat.* 17,445, Aug. 11, 1903.

IRON sand concentrates, powdered iron ore, blue-billy, or the like, are agglomerated into blocks by means of a solution of water-glass, and the blocks are hardened in a chamber through which hot air and steam are passed, so that the atmosphere of the chamber may be kept hot and moist without condensation of water. Compare *Eng. Pat.* 21,880 of 1902, and 15,188 of 1903; this J., 1903, 1090, and 1904, 664.—E. S.

Sulphide Ores or Compounds; Treating — preparatory to Smelting. T. Huntington and F. Heberlein, London. *Eng. Pat.* 13,454, June 16, 1903.

THE sulphide ores are roasted in a suitable furnace "until the proportion of sulphur is reduced to a suitable degree," and are then quickly cooled by the aid of water. The cooled ore is then placed upon a layer of hot ore or fuel in a receptacle through which a current of air is passed, whereby the oxidation is completed, and the mass is fitted for transference to a blast furnace for reduction of the metal. Compare *Eng. Pats.* 8064 of 1896, and 3795 of 1897; this J., 1897, 543 and 683.—E. S.

Ores [Zinc Sulphide or Complex]; Treatment of —. C. Cory, Swansea. *Eng. Pat.* 14,013, June 23, 1903.

ZINC sulphide ores are mixed with coal and with a small proportion of sago (say from $\frac{1}{2}$ to 2 per cent. of the mixture), and the powdered mixture is subjected to the action of live steam, hot enough to rupture the starch cells of the sago. The plastic mass is then made into briquettes, which are heated in retorts lined with carborundum, to obtain zinc by distillation. The briquetting with the aid of sago, used as described, of sulphide and complex ores, generally, is also claimed.—E. S.

UNITED STATES PATENTS.

Sulphides from Ores; Apparatus for Use in certain Processes for Extracting —. G. D. Delprat, Assignor to Broken Hill Proprietary Co., both of Australia. *U.S. Pat.* 763,662, June 28, 1904.

THE invention relates to apparatus for use in the process of floating concentrates from ores to the surface of a body of liquid. A pan having an inclined bottom is provided with an adjustable distributing plate at its upper end, having its lower edge close to the bottom of the pan. There is a discharge for the concentrates at the upper part of the pan, over a sump at the lower end of the inclined bottom; a vertical baffle-plate extends from the beginning of the discharge to near the lower edge of the bottom, separating the sump from the pan, and maintaining a submerged entrance to the sump for the tailings from the pan. Means for feeding ore and acid solution, and for heating the pan, are provided. See also *Eng. Pat.* 27,132 of 1903; this J., 1904, 610.—E. S.

Smelting and Reducing Metals; Process of —. C. Diesler, Coblenz, Germany. U.S. Pat. 764,044, July 5, 1904.

SEE Eng. Pat. 930 of 1901; this J., 1902, 261.—T. F. B.

Ore Separator; Magnetic —. F. J. King, Croydon, Surrey. U.S. Pat. 765,013, July 12, 1904.

SEE Eng. Pat. 5209 of 1902; this J., 1902, 1399.—T. F. B.

FRENCH PATENT.

Ores; Treatment of —. [Vacuum Filter for Solutions of Metals.] The Rapid Cyanide Treatment, Limited. Fr. Pat. 340,238. Feb. 6, 1904.

THE crushed ores are placed, with the dissolving solution, in a closed rotating, horizontal cylinder, with filtering material arranged within its sides and ends upon a grill of wooden supports, in such manner that the vacuous spaces communicated with a cased aperture centrally placed at one end of the cylinder, from which the filtered liquid flows down a vertical pipe connected to a pump, by means of which a partial vacuum is formed on the discharge side of the filtering material. The solvent solution is supplied to the cylinder through a pipe in connection with a forcing pump and an ozonising apparatus, so that air or ozonised air may be introduced. By means of the pump, pressure, say not exceeding 1 kilo. per sq. cm., may be put upon the contents of the cylinder on the supply side of the filtering material. After the solvent solution and washings have been forced through the filtering material, leaving the layers of pulp practically dry, the revolution of the cylinder is suspended, so that the dried pulp may fall by gravity on the simultaneous cessation of the out-draught and establishment of equilibrium between the opposite sides of the filtering material. The cylinder has removable doors on its sides for charging and discharging.—E. S.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(A).—ELECTRO-CHEMISTRY.

Aluminium Anodes; Dimensions of Films on —. W. R. Mott. Electrochem. Ind., 1904, 2, 268—271.

IN studying the formation of anode films on aluminium electrodes in phosphate solutions, the author finds that the thickness of the film is approximately a linear function of the voltage. Various methods were used for measuring the thickness. From the gain in weight of the anode, as also from the coulombs required for the formation, the calculation can be made. By the interference colours of the film an accurate and easy method of measurement is available, whilst by actually separating the film from the metal the thickness can be directly measured. The approximate thickness with different voltage is given as:—1 volt, 0.000001 cm.; 20, 0.00002; 80, 0.00008; and 320 volts, 0.0003 cm.—R. S. H.

Hydrosulphites [Hyposulphites] of Sodium and Calcium; Electrolytic Preparation of —. A. R. Frank. Elektrochem., 1904, 9, 450—452.

THE author describes his work on this subject, and in particular replies to the criticism of Elbs and Becker (this J., 1904, 611). The statement that a saturated solution of calcium bisulphite contains only 9.3 grms. per litre, is said to be quite incorrect; solutions containing up to 90 grms. are in everyday use, and with such concentrated solutions the solid calcium hydrosulphite can be electrolytically prepared with a good yield.—R. S. H.

ENGLISH PATENTS.

Ozonising Air and other Gases; Apparatus for —. R. F. Wood-Smith, London. Eng. Pat. 17,885, Aug. 18, 1903.

THE invention relates to improvements in ozonising apparatus of the Andreoli type. A plate of sheet metal,

such as aluminium, is provided on one or both of its faces with a number of projecting points, formed by stamping holes alternately from opposite sides of the plate. Spacing pieces separate the points from two dielectric plates of micanite, arranged one on each side of the aluminium plate, and metal plates are fixed against the outer surfaces of the micanite.—B. N.

(B).—ELECTRO-METALLURGY.

Refining Gold Alloys; Electrolytic Process of —. E. Wohlwill. Electrochem. Ind., 1904, 2, 261—264.

THE author extends his previous article (this J., 1904, 717) by considering the factors which limit the more general application of the electrolytic process. On account of the low temperature and current density employed, the Philadelphia results do not give satisfactory data. If the temperature be raised from 50°—55° C. to 65°—70° C., gold containing up to 15 per cent. of silver can be dealt with advantageously by this method. Moreover, the interest charges are considerably reduced, since it is possible to recover from 80 to 82 per cent. of the anode gold in 24 hours, when the current density is increased to the proper extent.—R. S. H.

Electrolysis with well-stirred Electrolytes. H. Sand. Z. Elektrochem., 1904, 9, 452—454.

REFERRING to the recent publication of Amberg (this J., 1904, 667), the author draws attention to his work on the electrolysis of an acid solution of copper sulphate (this J., 1901, 725). From this it appears that the current density is only limited by the rapidity of rotation of the electrode, and that consequently the condition of the metal deposit is not directly dependent on the current density. The effect of stirring is to diminish the alterations of concentration in the immediate neighbourhood of the cathode, which alone are capable of exerting a very great influence on the nature of the deposit.—R. S. H.

ENGLISH PATENT.

Metallic Compounds; Reducing of —, and Fusing of Metals, in particular of Nickel and Iron, in the Electric Furnace. C. D. Abel, London. From Siemens and Halske Akt.-Ges., Berlin. Eng. Pat. 19,366, Sept. 8, 1903.

IN the reduction of metallic compounds (particularly of nickel protoxide) and in the fusing of metals, such as nickel and iron, in the electric furnace, the lower carbon electrode is covered, before the process begins, with a layer of slag, such as of magnesia, with an addition of fluorspar, conducting to electricity, and such as may remain "in a tough or solidified form at the reducing or smelting temperature." —E. S.

UNITED STATES PATENT.

Vanadium and its Alloys; Process of Manufacturing —. G. Gin, Paris. U.S. Pat. 765,001, July 12, 1904.

SEE Fr. Pat. 340,413 of 1904; following these.—T. F. B.

FRENCH PATENT.

Vanadium and its Alloys; [Electrolytic] Manufacture of —. G. Gin. Fr. Pat. 340,413, Feb. 13, 1904.

THE process consists in electrolysis a bath of fused calcium fluoride, in which the cathode is a block of steel, and the anode is an agglomerated mixture of carbon with a vanadium oxide. The bath is fed with a certain quantity of fluoride of iron or of other metal, an alloy of which with vanadium it is desired to obtain. The decomposition of such a fluoride assists the process, and supplies the fluorine which continuously regenerates the electrolyte at the expense of the anode, and plays the part of the medium of transmission of the vanadium from the anode to the cathode. (See this J., 1903, 1248).—E. S.

XII.—FATTY OILS, FATS, WAXES, AND SOAP.

Ben Oil; Nature and Commercial Uses of — Bull. Imp. Inst. (Suppl. to Board of Trade J.), 1904, 2, 117—120.

"BEN" or "Behen" oil is obtained from the seeds of *Moringa pterygosperma* and *M. aptera*. A sample of pods and seeds of *M. pterygosperma* from Northern Nigeria yielded, on extraction with ether, 38 per cent. of a pale yellow, almost odourless oil, having a bland, agreeable taste. By filtration at 17°—18° C. the oil was separated into a liquid and a solid portion, which gave the following results on analysis:—

	Liquid Portion.	Solid Portion.
Specific gravity at 15° C.	0.914	...
Acid value.....	15.3	...
Free fatty acids (as oleic) } Per cent.	7.7	...
Saponification value.....	189.8	194.4
Iodine value.....	70.7	68.3

Another sample of ben oil, from Jamaica, was separated by filtration at 17° C. into 60 per cent. of a pale yellow oil and 40 per cent. of a nearly white, solid fat. On analysis the following results were obtained:—

	Liquid Portion.	Solid Portion.
Specific gravity.....	0.9124 at 15° C.	*0.9350 at 100° C.
Acid value.....	8.7	7.2
Free fatty acids (as oleic) } Per cent.	4.4	3.6
Saponification value.....	196.3	193.6
Iodine value.....	70.1	65.2

* Compared with water at 15° C.

If ben oil could be produced at a sufficiently cheap rate, it would be likely to find a market as an edible oil, whilst the liquid portion might be of use as a lubricant for fine machinery. (See also Lewkowitch, this J., 1904, 25).

—A. S.

ENGLISH PATENTS.

Oils; Appliance [and Process] for Use in Refining — T. Macalpine, London. Eng. Pat. 15,457, July 13, 1904.

AN upright cylindrical vessel, the bottom of which is conical in shape, and provided with a draw-off cock and perforated false bottom, is partially filled with granular material, such as coke, &c. Pipes for introducing compressed air, and the solution with which the oil is to be treated, enter the vessel below the false bottom, on which the granular material rests. The refining reagent is run into the vessel and allowed to saturate the granular material, the excess being run off. The crude oil is then introduced, and agitated with the granular material by blowing compressed air through the mass.—T. F. B.

Fat or Wax-like Substances from Hydrous Materials; Extraction of — T. A. Hearson, London; F. Frank and M. Ziegler, Berlin. Eng. Pat. 4867, Feb. 27, 1904.

THE raw material is extracted without preliminary drying by means of vapours of benzene, carbon bisulphide, acetone, alcohol, chloroform, or carbon tetrachloride, and the mixed solvent and water vapours are subsequently condensed in a receiver, where separation takes place through gravitation.—C. A. M.

Lubricants; Production of — W. P. Thompson, London and Liverpool. From Ges. z. Verwerthung der Boleg'schen Wasserlöslichen Mineralöle u. Kohlenwasserstoffe, G. m. b. H., Berlin. Eng. Pat. 13,473, June 16, 1903.

MINERAL oils soluble in water (this J., 1904, 655) are oxidised by ozone or compressed air at 70°—105° C., and then mixed with a small proportion of ceresin or paraffin

(previously treated with 1—2 per cent. of alkali solution) and also with water, soap solution, or gelatin solution according to requirements.—C. A. M.

FRENCH PATENT.

Soap containing Alcohol. A. Wolff. Fr. Pat. 340,247, Feb. 8, 1904.

THE claim is for a soap containing, e.g., 15 parts of anhydrous coconut oil soap, 5 parts of water, and 80 parts of alcohol, with or without the addition of perfumes or disinfectants.—C. A. M.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(B.)—RESINS, VARNISHES.

Kawi Resin; Supposed — from Queensland. Bull. Imp. Inst. (Suppl. to Board of Trade J.), 1904, 2, 91—92.

THE sample consisted of a single rounded block, weighing about 3 lb., composed of a bright yellow transparent resin with a number of dark streaks and opaque patches scattered throughout its mass. The resin had a pleasant aromatic odour, was completely soluble in alcohol and ether, slightly soluble in benzene, and very slightly so in chloroform. Sp. gr., 1.0543; acid value, 136.6; ash, 0.13 per cent. The essential constituents of the resin are the same as those of the resin of *Callitris verrucosa*, viz., pimicic and callitric acids (see this J., 1901, 1232), and it may therefore be regarded as a sandarac derived from a species of *Callitris*. Commercial sandaracs occur in characteristic, elongated, light yellow tears, the most valuable variety (60s.—70s. per cwt.) being African sandarac obtained from *Callitris quadrivalvis*. The Queensland resin, owing to its unusual form, would probably be worth only 25s. to 30s. per cwt., instead of the 35s. per cwt. obtained for the ordinary tear form of Australian sandarac.—A. S.

Tocamahac Resin, Commercial; Constitution of — A. Tschirch and O. Saal. XX., page 798.

(C.)—INDIA-RUBBER, &c.

Rubber from British Central Africa. Bull. Imp. Inst. (Suppl. to Board of Trade J.), 1904, 2, 83.

A SAMPLE of rubber as collected and offered for sale by the natives of British Central Africa, and stated to be obtained from the vines of the indigenous *Landolphia*, was examined. The rubber was not sticky and exhibited good elasticity and tenacity. It gave the following results on analysis:—Moisture, 1.3—1.5; caoutchouc, 87.5—89.7; resin, 4.7—4.8; dirt, 4.2—6.3; ash (included in dirt), 0.6—0.8 per cent. The sample may be regarded as good, clean ball rubber. It was valued at 3s. 2d.—3s. 3d. per lb. on the London market.—A. S.

"Mpai" Rubber from Amatongaland, Natal. Bull. Imp. Inst. (Suppl. to Board of Trade J.), 1904, 2, 94—95.

THE specimen rubber was obtained from the "Mpai" or "Mfubu" tree, probably a species of *Ficus*. It consisted of a light-brown, flat, elongated cake. The material had a somewhat fibrous structure, resembling that of gutta-percha; it exhibited very little elasticity, but considerable tenacity. In warm water it softened a little without becoming sticky and could then be readily drawn out. The specimen contained:—Moisture, 28.4; resin, 49.9; caoutchouc, 19.6; dirt, 2.1; ash (included in dirt), 0.79 per cent. It is worth about 10½d. or 11d. per lb.—A. S.

Rubber of Landolphia Kirkii from Amatongaland, Natal. Bull. Imp. Inst. (Suppl. to Board of Trade J.), 1904, 2, 95—96.

Two capsules of rubber from the "Ibundu" vine, *Landolphia Kirkii*, have been examined. The rubber was

light pinkish-brown externally, but deep reddish-brown within; it was not sticky, and exhibited very good elasticity and tenacity. On chemical examination the samples furnished the following results:—

	Sample A.	Sample B.
	Per Cent.	Per Cent.
Moisture	7.7	9.1
Caoutchouc	80.1	75.7
Resin	6.9	10.3
Dirt	5.3	4.9
Ash (included in dirt)	0.31	0.37

The rubber thus appears to be of good quality and would be worth about 4s. per lb. in the London market as compared with 4s. 8d. per lb. for fine Para rubber.—A. S.

Caoutchouc Molecule; Decomposition of the — with Formation of a Cyclic Hydrocarbon. R. Ditmar. Monatsb. f. Chem., 1904, 25, 464—474.

THE author has examined further the amorphous yellow product obtained by the action of concentrated nitric acid on crude Para caoutchouc (see this J., 1902, 626, 1404). 50 grms. of crude Para rubber in very small pieces were exhausted with acetone for the removal of resin, fat, and oils, and the residue was extracted successively with 4.4 per cent. caustic potash solution and distilled water, and dried *in vacuo* over sulphuric acid, till of constant weight. The caoutchouc so obtained is soluble in the usual solvents and also in melted paraffin, hot benzaldehyde, and quinoline. The crude rubber also is soluble in the two latter solvents. From a warm quinoline solution the caoutchouc separates on cooling, and also on treatment with ether, in the form of elastic structureless pellicles, which can be kneaded together and remain plastic for a long time. The best results on nitration were obtained with red fuming nitric acid. The nitro product is soluble in glacial acetic acid, acetone, and quinoline, but is reprecipitated from solution by ether. The alkali salts of the product are soluble in water. From the results of reduction, acetylating, and other experiments, the author concludes that the nitro product is the 5,6-dinitro-2,3-dihydro- or 3,6-dinitro-2,5-dihydrocuminic acid, $C_9H_7 \cdot C_6H_4(NO_2)_2 \cdot COOH$.—A. S.

Caoutchouc and its Distillation Products; Chemistry of —. R. Ditmar. Ber., 1904, 37, 2430—2434.

THE author considers that the product obtained by Wallach (Annalen, 238, 87) by the action of fuming nitric acid on the sesquiterpene, $C_{15}H_{24}$, isolated from cubeb, patchouli, galban, cade, and Sabine oils, is identical with the dinitro compound (5,6-dinitro-2,3-dihydro- or 3,6-dinitro-2,5-dihydrocuminic acid) formed by the action of nitric acid on rubber (this J., 1902, 626; Ber., 1902, 35, 1948, 3265; also preceding abstract). From the behaviour to nitric acid of the products of the destructive distillation of caoutchouc, the author concludes that this nitric acid reaction is a general one for sesqui-, di-, and polyterpenes. 0.5 kilo. of crude Para rubber was destructively distilled, and the crude oil obtained, the so-called "caoutchoucine" fractionated, the following portions being collected:—(1) 35°—70° C., isoprene fraction, colourless, very mobile liquid; (2) 70°—150° C., slightly yellowish, mobile liquid; (3) 150°—200° C., dipentene fraction, brownish, mobile liquid; (4) 200°—300° C., heveene fraction, dark brown, mobile liquid; and (5) above 300° C., di- and polyterpene fraction, very dark brown, oily liquid. It was found on treating the fractions with nitric acid, that the course of reaction was different with the concentrated and with the fuming acid, but the final products were the same with both reagents. Fractions (1) to (4) gave resins; fraction (5) gave a solution which when poured into water yielded a large amount of the dinitro compound. From the resins yielded by (3) and (4), 0.1 and 0.8 grm., respectively, of the dinitro compound were isolated.

—A. S.

XIV.—TANNING; LEATHER, GLUE, SIZE.

(*Divi-Divi*) *Pods of Casalpinia Coriaria from India.* Bull. Imp. Inst. (Suppl. to Board of Trade J.), 1904, 2, 92—93.

THE sample (No. 18,545) consisted principally of husks with a few small unbroken fruits containing one or two minute black seeds. It resembled in appearance the divi-divi of commerce. In the following table are given the results of the chemical examination of the present sample, two samples of Indian divi-divi previously examined, and a specimen received from Queensland in 1898:—

	Indian Samples.			Queensland Sample.
	No. 18,545. Per Cent.	No. 8026. Per Cent.	No. 8028. Per Cent.	Per Cent.
Tannin (calculated on material dried at 105° C.)	45.4	19.7	32.8	51.4
Total soluble matter ..	68.5	65.9	46.0	68.3
Moisture	13.3	12.8	13.1	15.9
Ash (calcium carbonate, with a little ferric oxide and silica).	2.6	3.1	3.3	2.2

The present specimen is thus of much better quality than either of the previous Indian samples, and would probably sell readily at 8l. 10s. to 11l. per ton.—A. S.

Bleaching of Leather. B. Kohnstein. Der Gerber, 1904, 30, 189—190.

METHODS for bleaching leather may be divided into (a) natural and (b) chemical processes. The former comprise the action of direct sunlight, only applicable to oil-leathers, and freezing, which gives a very soft leather. When inorganic acids are used, it is advisable to dry out and then bleach, as such acids, if allowed to penetrate right through the hides, are difficult to remove by washing. Oxalic acid, sulphuric acid, and sulphurous acid vapour are used, also lead acetate solution (9 kilos. in 320 litres of water), with a subsequent bath of sulphuric acid ($3\frac{1}{2}$ kilos. in 320 litres of water). Potassium permanganate with sulphuric acid, also hydrogen peroxide, have proved too costly; but the use of barium or sodium peroxide is established in America. The last is employed as follows:—1 kilo. of sulphuric acid (66° B.) is poured into 400 litres of cold water, 1.75 kilos. of sodium peroxide are gradually added, and finally ammonia until the liquor is faintly alkaline to litmus. A bleaching effect is secured by mixing white or bluish white solid materials, such as tale, china-clay, or "barytes" with the fat-liquor.—R. L. J.

[Spueing] on Upper Leather; Formation of White Patches —. W. Eitner. Der Gerber, 1904, 30, 173—174.

MUSEUM specimens of chrome-leather containing 5 per cent. of grease (soup and moëllon and neatsfoot oil), which had been left in contact with vegetable-tanned leather (horse), containing 17 per cent. of grease, showed clearly-defined white patches at the points of contact. These proved to be stearin crystals, which had penetrated right through the chrome-leather, and showed on both sides. No evidence could be obtained as to whether these had passed from the one leather to the other in a state of solution, i.e., dissolved in the more fluid components of the grease used on the vegetable-tanned leather, or whether they had passed directly through the membrane represented by the chrome-leather as crystalloid substances are known to do. The author cites the appearance of magnesium sulphate on the surface of boots, arising from the loading material in the canvas linings, and considers, as a practical result, that stearine should be avoided in the fat-liquoring of chrome-leather and the greasing of lightly tanned calf, whilst its use is indicated for heavily tanned or hot-stuffed chrome goods.

—R. L. J.

ENGLISH PATENT.

Hides, Skins, and Sides of Leather; Apparatus for Treating (Bleaching) — E. C. Amidon, Corry, Pa., U.S.A. Eng. Pat. 11,249, May 16, 1904. Under Internat. Conv., Jan. 28, 1904.

SEE U.S. Pat. 759,844 of 1904; this J., 1904, 671.—T. F. B.

XVI.—SUGAR, STARCH, GUM, Etc.

ENGLISH PATENT.

Starch and Dextrine; Method of and Apparatus for the Production of Soluble — Calico Printers' Assoc., Ltd., Manchester, and W. Browning and J. J. Barlow, Accrington. Eng. Pat. 19,499, Sept. 10, 1903.

SEE Fr. Pat. 336,903 of 1903; this J., 1904, 449.—T. F. B.

FRENCH PATENTS.

Starch; Process and Apparatus for the Continuous Extraction of — W. H. Uhlund. Fr. Pat. 338,792, Nov. 11, 1903. (See this J., 1903, 642).

THE starch milk is directed downwards, the velocity of the current being slowly and gradually retarded, the movement of the deposited starch being accelerated as the lower part is reached, while the water is drawn off laterally. The upper part of the apparatus is cylindrical or polygonal, the lower conical; the supply pipe rests entirely submerged in a cylinder to allow of the escape of entrained air, while a series of baffles directs the water laterally to the overflow, the rate of escape being regulated by cocks. There is a special arrangement for drawing off the separated starch, consisting of a cock of large diameter and wide aperture, and capable of being closed or regulated instantly so as to run off the starch at the exact speed found most suitable.

—L. J. de W.

Achroodextrin; Process of Manufacturing — by Treatment of Peat. G. Reynaud. Fr. Pat. 340,719, Feb. 25, 1904.

SEE U.S. Pat. 761,542 of 1904; this J., 1904, 721.—T. F. B.

XVII.—BREWING, WINES, SPIRITS, Etc.

Albuminoid Content of Barley; Simple Method for Measuring the —, by Pappenheim's Triacid Solution. P. Lindner. Woch. f. Brau., 1904, 21, 397—398.

PAPPENHEIM's triacid solution (see U. Pepper, Woch. f. Brau., 1903, 20, [29]), which in the form of the base contains the colouring matter of Unna's Methylene Blue and Eosine, has been suggested as a means of obtaining some idea of the proportion of albuminoids present in barley and in food preparations. The author has examined, by means of this dyestuff, three specimens of barley containing 8, 12.7, and 16.1 per cent. of albuminoids, determined by Kjeldahl's method. It was found that the principal seat of the albuminoids, which are coloured red by the above dyestuff, lies in the layers of cells situate immediately below the aleurone layers and especially in the neighbourhood of the central furrow. Although there is a considerable difference in appearance between the cross sections of the barley containing 8 per cent. and of that containing 16.1 per cent. of albuminoids, yet no conclusion can be drawn therefrom concerning the whole corn. The author therefore adopted the procedure made use of by Weissbein in the examination of food preparations; 0.2 gm. of the finely-powdered barley was placed in a small tube, together with 10 c.c. of water and 6 drops of the dyestuff solution. The tube was well shaken up several times, and at the end of five minutes was centrifugalised in a hand machine. In two minutes the meal was found to be collected at the pointed end of the tube, and the coloured liquid was poured off. To remove excess of the dyestuff, the meal was stirred up with 2 c.c. of water, the volume of which was then made up to about 10 c.c.; this liquid was then separated by centrifugalising. The appearance of the residue varies considerably,

barleys poorest in albuminoids appearing blue to green, the others being sprinkled with red. In order to compare different barleys better, the residual meal was stirred up with 1 c.c. of water and quickly poured out on to a stiff card and spread out so as just to cover a circle "10 cm." in diameter, any liquid being then removed by means of filter paper. When dry the various preparations may be compared with one another and with a permanent preparation. Working thus it is easy to analyse four barleys in this way in 20 minutes, and so discover whether they are rich or poor in albuminoids.—T. H. P.

Malt with Short Acrospire and the Beer yielded by it. R. Holzhäuser. Woch. f. Brau., 1904, 21, 403—404.

IN the preparation of malt with short acrospire growth, which the author recommends for beers of the Pilsener type, it is important not to steep for too great a period. Using the aëration method of steeping, a total of 26 hours under water and 26 hours dry is sufficient. The author gives the details of his method of flooring, by which he obtains an acrospire of $\frac{1}{4}$ to $\frac{3}{4}$ of the length of the corn and with moderately short, stout rootlets. No heating takes place during the flooring, the highest temperature attained being 61°—63° F. Low temperatures are so easily maintained that it is possible to steep 6—10 per cent. more barley for the same floor area than when the old method is used. The green malt is thoroughly dried on the upper floor of the kiln, and is then dried off at an average temperature of 194° F., which is maintained for 3½ hours. The malt prepared in this way is mealy, has a somewhat aromatic flavour, and seldom contains steely-ended corns. The yield of malt is very high, often reaching 80 per cent., and the colour of the laboratory wort corresponds with 0.25 c.c. of N/10 iodine solution. The mashing method used by the author is a rapid process, the temperatures being 149°, 158°, and 167° F. Saccharification takes place quickly and both the first and second worts are perfectly clear. The average extract obtained is 72.5—73 per cent. calculated by Windisch's tables. The first half-dozen brews carried out by this method deposited large quantities of albuminoid matter on fermentation and the beers cleared slowly, although perfectly, in the lager cellar; with subsequent worts, however, a normal behaviour was obtained. The course of the primary and after fermentations shows that the wort yielded by malt with short acrospire growth contains considerably more malto-dextrins and dextrin than wort prepared by the same mashing process from malt with greater acrospire development. The final beer is pure yellow in colour, has a full malty flavour and a pleasant bitter taste, and retains its head extremely well. During a severe winter it showed no inclination to become turbid, and can be kept for five weeks without forming any deposit.

—T. H. P.

Pale, High-Dried Malt; Preparation of — F. Söding. Woch. f. Brau., 1904, 21, 438—439.

IN the kilning of pale malt at high temperatures, it is important that the malt should be well dried on the upper floor of the kiln before it is passed down to the lower floor. The temperature must be kept down until the combs can be readily rubbed off between the hands. Any cooling of the malt on the upper hearth, such as may take place in wet weather, must be avoided, as it is always accompanied by increase in the colour. The author therefore passes the air through a layer of dry malt combs spread on a small wire floor, all moisture being in this way removed from the air. High-dried pale malt must not be stored warm, as it speedily deteriorates; it is therefore advisable to spread it out immediately after unloading, the small amount of moisture absorbed having no prejudicial effect on the wort. Beer prepared from malt kilned in this way has a full taste and pleasant aroma not met with in ordinary pale beers.—T. H. P.

Yeast; Use of — instead of Kräusen. G. Henne. Woch. f. Brau., 1904, 21, 427.

THE advantages of adding yeast to beer after the primary fermentation instead of "kräusening" are greater brilliancy,

better keeping quality, and retention of head, and the absence of any raw unripe taste. The addition of the yeast, the great disadvantage of which is the time taken up, especially in large breweries, is carried out as follows: About a bucketful of beer is taken from the cask, mixed intimately with healthy, thick, pasty yeast, and returned to the cask through a funnel. As vigorous frothing takes place, it is necessary to wait a little while in order to fill the cask completely, and when this is done the cask is tightly bunged again. About 2 litres of the pasty yeast should be taken to 20 hectolitres of beer (i.e., 0.1 per cent. by vol.). Mixing the yeast with boiled and cooled water before adding to the beer is not recommended, as the cooling of the water occupies considerable time. In the case of a beer which had become turbid and had assumed a very unpleasant flavour and smell, the author added about 4 litres of extremely vigorous pasty yeast to each cask. After being kept tightly bunged for 12–14 days, the beer became "water-white" and regained its normal pleasant flavour. This result is brought about by the agglomeration of the bacteria by the glutinous cell membrane of the yeast.

—T. H. P.

Bacterial Infection in the Brewery; Detecting — Falk, Hausmann, and Luff. *Z. ges. Brauw.*, 1904, 27, 524–528.

In the detection of bacterial infection in wort, beer, &c., by the pure yeast fermentation method first recommended by Prior, it is found that the yeast sediment deposited after 9–10 days rarely exhibits traces of bacteria, these (especially *sarcina* and lactic bacilli) not developing until the samples have been forced at 25° C. for 8–10 days in small sterilised flasks. Sporogenic yeasts, however, may be detected in the original sediments. Two cases of infected breweries have been successfully dealt with by this method.

—C. S.

Beer; Action of — on Metals. H. Seyffert. *Woch. f. Brau.*, 1904, 21, 398–400.

Cold brewery wort, left for some time in contact with sheet-iron, dissolves some of the latter, which can be readily detected in the liquid. When such wort is fermented, a considerable proportion or, in some cases, all of the iron is removed and passes into the yeast. The presence of iron in the beer injures the head-retaining properties. Also, beer in which iron, copper, or tin is immersed, becomes turbid, the action being especially rapid with the first two metals; with lead, no turbidity is obtained. With practice, the author's palate became very sensitive to iron in beer, so that he was able to detect quantities of this metal too small to be recognised by direct chemical tests. These small proportions of iron give to the beer a certain dryness and thinness of taste. The author's experiments show that beer should never be allowed to come into contact with an iron surface, and that contact with bright copper or brass should be as limited as possible. Tinned iron, which is so frequently used in beer filters, racking apparatus, &c., is especially dangerous, and should never be employed. Only well-tinned copper and brass are allowable, and these must be previously treated for some time (at least 24 hours) with beer residues, so that the white surface of the tin becomes slightly yellowish. Such apparatus should never be vigorously brushed or treated with alkalis, otherwise the thin protective coating may be removed. In general, thorough washing, first with cold, and then with hot water is sufficient. But when the wire gauze of the filter becomes stopped up, and it is necessary to clean it thoroughly with brushes and alkali or acid, it should be subsequently soaked in beer residues before being used again. The whole of the tin present in the beer may be readily precipitated in the following manner: 1 litre or more of the beer is rendered faintly alkaline with sodium carbonate, and heated to 60° C., by which means a flocculent precipitate, which readily settles, is formed. The clear supernatant beer is siphoned off and the residue filtered, dried, and ignited, the ash thus obtained being tested for tin. It is probable that the precipitate formed consists of a compound containing tin, phosphoric acid, and protein. —T. H. P.

Spirit; Production of Cheap — for Technical Purposes. M. Delbrück. *Z. Spiritusind.*, 1904, 27, 301.

ALTHOUGH 1 litre of petroleum furnishes 10,000 units of heat on combustion against 6,000 units yielded by 1 litre of alcohol, it is still possible for the latter to compete with the former for incandescent lighting purposes, provided that the price of alcohol is to that of petroleum in the proportion of 3 : 2. In countries where petroleum is dear this ratio is more nearly reached than in Germany, but, at the same time, the fiscal regulations of the latter country are of great assistance. With regard to the manufacture of cheap spirit, a decrease in the cost of production is considered likely by the author. Cheaper raw materials, the use of the beetroot and its by-products, and the cultivation of new varieties of potatoes, will diminish the price of the alcohol, as will also the protection of the raw materials from decomposition, caused by enzymes and the like. It will be found cheaper to dry potatoes instead of storing them in their natural state, the cost of drying was more than compensating for the loss which occurs on long keeping. The introduction of the "amyl" process from Japan has considerably cheapened the production of alcohol. This process gives practically a theoretical yield of alcohol combined with a great saving of malt, the latter being only used in sufficient quantity to liquefy the mash. Saccharification is brought about by inoculating the mash with the fungus *Amylomyces Rouzii*. The production, by patent apparatus, of alcohol of high percentage direct from the mash is of great importance. This strong alcohol is less contaminated by storage in wooden barrels than is weaker spirit, and is consequently preferable for technical uses. —W. P. S.

Arsenic; Electrolytic Methods for the Detection and Determination of Minute Quantities of — in Beer, Malt, Foodstuffs, &c. W. Thomson. *XXIII.*, page 799.

IX. Peroxydase Reaction; Velocity of —. A. Bach and R. Chodat. *XXIV.*, page 802.

ENGLISH PATENT.

Casks, Boxes, and other Receptacles; Impermeable Coatings or Linings for —. J. Wetter. *Eng. Pat.* 16,490, 1903. I., page 779.

UNITED STATES PATENT.

Brewing Kettle, Hop-Jack Tank, and Cooker; Combined —. C. F. Hettinger, Boston, Mass. *U.S. Pat.* 763,606, June 28, 1904.

THE claims are for the combination with a vessel adapted to be used as a cooker, brewing-kettle, and "hop-jack tank," an agitator therein, means for heating the same, of a "clean-out" in the bottom thereof and located at its lowest part, and of a telescopic hop-strainer removably attached to and directly over the clean-out, and means for removably attaching the hop-strainer from the outside of the vessel, and outlet, and a valve on the clean-out to lead the contents of the kettle to either a mash-tub or through a second strainer into a beer-cooler. —L. J. de W.

FRENCH PATENT.

Alcohol Vapour; Apparatus for Preventing Loss of — in Alcohol or Brandy Distilleries. J. Szabo von Szathmari. *Fr. Pat.* 340,581, Feb. 20, 1904.

SEE *Eng. Pat.* 4011 of 1904; this J., 1904, 452. —T. F. B.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(A.)—FOODS.

Margarine; Characteristic Values of —. E. Russell and V. H. Kirkham. *XXIII.*, page 801.

Fruit Juices; Use of Preservatives in — G. Heinzelmann. *Z. Spiritusind.*, 1904, 27, 299.

THE use of salicylic acid for preserving fruit juices has practically ceased in Germany, as the result of regulations based on the medical opinion that this acid is injurious to health, even in the small quantities employed for preserving purposes. Hydrofluoric acid having recently been detected in fruit juices, the author points out that there is a preservative on the market bearing the name "Frut," which consists of an aqueous solution of hydrofluoric acid. This is sold in special prepared flasks, and a powder is also supplied at the same time, consisting of calcium carbonate. The latter is to be added to the fruit juices before they are brought into use, in order to precipitate the hydrofluoric acid as calcium fluoride. As it is quite likely that in some cases insufficient calcium carbonate may be added, leaving excess of hydrofluoric acid in the juice, the use of this preservative is very objectionable. The most suitable preservative is alcohol, provided that a declaration of its presence be made.

—W. P. S.

Arsenic; Electrolytic Methods for the Detection and Determination of Minute Quantities of — in Beer, Malt, Foodstuffs, &c. W. Thomson. *XXIII.*, page 799.

ENGLISH PATENT.

Soluble Albumin [Casein] from Milk; Manufacture of — C. Lewis, Toronto. Eng. Pat. 11,094, May 13, 1904.

A SUFFICIENT quantity of alcohol is added to skimmed milk to cause precipitation of the casein and albumin. The latter are then separated, ground, and dried at a temperature below 149° F. to form the product claimed.—W. P. S.

UNITED STATES PATENT.

Evaporating Liquids; Apparatus for — M. Ekenberg, Assignor to Martin Ekenberg's Aktiebolag, Stockholm. U.S. Pat. 764,995, July 12, 1904.

SEE Eng. Pat. 10,124 of 1903; this J., 1903, 878.—T. F. B.

XIX.—PAPER, PASTEBOARD, Etc.

ENGLISH PATENT.

Viscose; Manufacture or Treatment of Threads or Filaments from — C. H. Stearn and C. F. Topham. Eng. Pat. 16,604, July 28, 1903. V., page 784.

UNITED STATES PATENT.

Cellulose; Process of Converting Wood — M. F. Ewen and G. H. Tomlinson, Chicago. U.S. Pat. 763,472, June 28, 1904.

CELLULOSE is converted into fermentable sugar by heating in a closed vessel with sulphurous acid gas to 120°–160° C., until the conversion is effected. The gaseous product derived from heating a solution of sulphurous acid is passed in until the vessel contains about 3 per cent. of sulphur dioxide and about 60–70 per cent. of water on the weight of the sawdust, and the mixture is heated by a separate application of heat or by introducing steam to supply the heat and water required to bring about the conversion, so that the pressure may be at least greater than three atmospheres without increasing the temperature above 160° C.—L. J. de W.

FRENCH PATENT.

Paper; Safety — [and Ink]. J. Rowan. Fr. Pat. 840,837, Feb. 29, 1904.

SEE Eng. Pat. 3909 of 1904; this J., 1904, 453.—T. F. B.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Quinine Glycerophosphates. P. Carré. *Bull. Soc. Chim.*, 1904, 31, 803–805.

Basic quinine glycerophosphate is obtained by mixing 1 mol. of glycerophosphoric acid (this J., 1904, 35 and 1128) with 2 mols. of the base, in alcoholic solution; if absolute

alcohol be the solvent the resulting salt is anhydrous; if 80 per cent. alcohol be used it contains 4 mols. of water of crystallisation. In either case it is precipitated from the alcoholic solution with ether. Dried at normal temperatures the hydrated salt has the formula—



It is readily rendered anhydrous at 100° C., and then has the m. pt. 148.5° C. The hydrated salt begins to melt at 147° C.

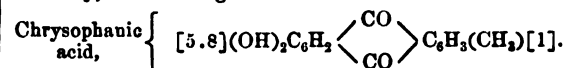
Neutral quinine glycerophosphate is prepared as above, but with 1 mol. of acid and of base. It also forms anhydrous or hydrated crystals, according to the solvent used. The hydrated salt has the formula—



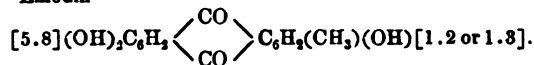
It becomes anhydrous at 100° C., and melts at 151°–152° C. Both salts occur in fine acicular crystals. The basic salt is soluble in alcohol, insoluble in ether, sparingly soluble in water; in the hydrated state it is insoluble in acetone, but it becomes soluble therein when anhydrous. The neutral salt is more soluble in alcohol and in water than the above; in other respects its behaviour to solvents is the same. Since the hydrated salts are insoluble in acetone, they may be obtained in fine crystals by adding that body to the alcoholic solutions.—J. O. B.

Chrysophanic Acid and Emodin; Constitution of — H. A. D. Jowett and C. E. Potter. *Chem. Soc. Trans.*, 1903, 83, 1327–1334.

CHRYSOPHANIC acid and emodin are known to be respectively the di- and tri-hydroxy derivatives of a methylantraquinone, but the position of the substituting groups has not yet been satisfactorily determined. Attempts to synthesise the compounds failed, but the results obtained enable the authors to propose, with a considerable degree of certainty, the following formulæ for them:—



Emodin—



—A. S.

Quercitol; A Lavo-rotatory Modification of — F. B. Power and F. Tutin. *Chem. Soc. Trans.*, 1904, 85, 624–629.

By extraction with alcohol, the authors isolated from the leaves of *Gymnema sylvestre* (Br.), a colourless crystalline compound, $\text{C}_6\text{H}_7(\text{OH})_5.\text{H}_2\text{O}$, m. pt. 174° C.; $[\alpha]_D = -73.9^\circ$. The compound is thus a hydrated lavo-rotatory quercitol. It loses its water of crystallisation at 110° C. Like d-quercitol it yields malonic acid on oxidation with permanganate, and a diketotrihydroxyhexahydrobenzene when oxidised with sodium hypobromite.—A. S.

Oil of Turpentine; Action of Salicylic Acid on —

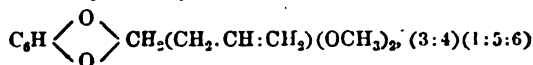
E. Tardy. *J. Pharm. Chim.*, 1904, 20, [2], 57–58.

HAVING set aside for some years the viscous liquid esters obtained by the action of salicylic acid on oil of turpentine and subsequent fractionation, it was recently found that these had crystallised to a fine crop of bornyl salicylate, m. pt. 44°–45° C., $\alpha_D = 34^\circ 20'$. The oily liquid originally obtained was therefore mainly bornyl salicylate, prevented from rapid crystallisation by the presence of adherent impurities. Attention was directed to these abandoned experiments by the recent publication of a patent for the preparation of borneol, isborneol, and camphor from oil of turpentine by the action of salicylic acid, and the subsequent saponification of the esters thus formed.—J. O. B.

Dill- and Parsley-Apiols; Constitution of — H. Thoms. *Archiv der Pharm.*, 1904, 242, [5], 344–347.

THE behaviour of the ethylated phenol in the case of dill-apiol shows that the ethoxy group must be in the para-position; while in the formation of a quinone from the ethylated product an ethyl and a methyl group are split off.

The two methoxyl groups are therefore present in juxtaposition, and dill-apiol is a (1) allyl- (5.6) dimethoxy- (3.4) methylenedioxybenzene—



Parsley apiol, on the other hand, has been shown by the author to be (1) allyl (2.5) dimethoxy (3.4) methylene dioxybenzene (this J., 1903, 22, 1255).—J. O. B.

Matico Leaves; [Essential] Oil of —. H. Thoms. *Archiv der Pharm.*, 1904, 242, 328—344.

THE oil employed had the sp. gr. 1.1313. Fractionated in an atmosphere of carbon dioxide, it gave 1.9 per cent. at 270° C.; 17.1 per cent. at 270°—292° C.; 46.0 per cent. at 282°—286° C.; 20.1 per cent. at 286°—288° C.; and 14.9 per cent. of resinoid residue. These fractions were refractionated under reduced pressure, and the following constituents isolated. A hydrocarbon boiling at 121°—130° C. under 13 mm. pressure, solidifying at -18° C. A trace of an unidentified phenol ester, which gives a bromo derivative, m. pt. 123°—124° C. A considerable amount of dill-apiol; a small quantity of parsley-apiol. No matico camphor or asarone, such as was found in commercial matico oil 20 years ago, could be isolated. Nor could the matico ether, $\text{C}_{14}\text{H}_{18}\text{O}_4$, of Fromm and Emster be isolated as a distinct body. This supposed constituent was probably a mixture of the two apiols. Similarly, the so-called maticoic acid obtained by those authors by oxidation with permanganate, is a mixture of dill-apiolic acid, m. pt. 151° C., and parsley-apiolic acid, m. pt. 175° C. No proof of the splitting off of carbon and oxygen atoms, by means of bromine, as stated by Fromm and Emster, could be established. Doubtless these investigators were dealing with a mixture of bromo-bodies containing tribromo-apiol, which, however, they failed to isolate. The author finds that the bromo derivatives of the lower boiling fractions of matico oil have relatively higher melting points, contain more bromine, and possess a lower methoxyl content. The richer in apiol the fractions, the lower are the melting points of its bromo derivatives. The ratio of methoxyl contained in them is in inverse proportion to the amount of bromine. —J. O. B.

Tacamahac Resin, Commercial; Constitution of —. A. Tschirch and O. Saal. *Archiv der Pharm.*, 1904, 242, [5], 395—400.

THE resin [a fragrant oleo-resin of undetermined botanical source, allied in properties to elemi] was insoluble in water, soluble in most organic solvents, including light petroleum spirit and carbon bisulphide. Its alcoholic solution has an acid reaction. The resin, purified from foreign matter by solution in ether, melts at 85°—87° C. It contains 3 per cent. of gum; 0.5 per cent. of tacamahinic acid, $\text{C}_{15}\text{H}_{22}\text{O}_2$, amorphous, melting at 95° C., removed by shaking out the ethereal solution with 1 per cent. ammonium carbonate solution; 0.5 per cent. of tacamaholic acid, $\text{C}_{15}\text{H}_{22}\text{O}_2$, m. pt. 104°—106° C., removed by dilute sodium carbonate solution; 3 per cent. of essential oil with a camphoraceous and turpentine odour, the greater part distilling between 170° and 175° C., the rest between 175° and 210° C.; 50 per cent. of α -takoresene and 30 per cent. of β -takoresene; the former, $(\text{C}_{15}\text{H}_{20})_2\text{O}$, insoluble in alcohol, sp. gr. 0.892, m. pt. 93°—95° C.; the latter, $(\text{C}_{15}\text{H}_{20})_2\text{O}$, soluble in that solvent; m. pt. about 82° C.; with traces of bitter principle and 10 per cent. of foreign impurities.—J. O. B.

Digitalin; Detection of —. C. Binz. XXIII., page 800.

ENGLISH PATENTS.

Pharmaceutical Compound [Trichlorisopropyl Alcohol]; Manufacture of —. H. E. Newton. From the Farbenfabriken vorm. F. Bayer and Co., Elberfeld. Eng. Pat. 18,245, Aug. 24, 1903.

METHYL bromide or other halogen methyl compound is mixed with dry alcohol-free ether and allowed to act upon magnesium filings. Dry chloral in dry alcohol-free ether

is added, when a halogen magnesium compound of trichloroisopropyl alcohol is formed, $\text{CCl}_3.\text{CH}(\text{OMg.halogen}).\text{CH}_3$. When this latter is decomposed by ice-water, trichloroisopropyl alcohol is liberated, melting at 48°—49° C. after recrystallisation.—F. S.

Alcohols and Alcohol Derivatives applicable as or in the Manufacture of Perfumes, Flavours, or the like, and of Primary Alcohols generally; Manufacture of —. L. Bouveault and G. Blanc, Paris. Eng. Pat. 14,758, July 2, 1903.

THE preparation of the following new alcohols is claimed:—Methyl-8-nonanol-1; dimethyl-3:7-octene-6-ol-1; undecylene-10-ol-1; oleic alcohol; hexahydrobenzyl alcohol; campholene alcohol; campholic alcohol; paramethoxyphenyl-2-ethanol; 2:2-dimethylbutanediol-1:4; 2:2-dimethylpentanediol-1:5; 2-methylhexanediol-1:6; octanediol-1:8; decanediol-1:10. Also derivatives of the new alcohols, viz., butyrate, valerate of nonyl and of doleacyl; oxide, acetate, and butyrate of campholene alcohol; butyrate and valerate of phenylethyl; formate, acetate, butyrate, and valerate of phenylpropyl; acetate of paramethoxyphenylethyl; oxide of methyloctyl. These alcohols are manufactured by reducing the corresponding acid ester with sodium in absolute alcohol. The alcohol and ester must be free from all traces of moisture to secure the best yield.—F. S.

Oxybenzaldehydes and Oxybenzoic Acids; Manufacture of —, and Intermediate Products of the said Manufacture. J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine. Eng. Pat. 17,347, Aug. 10, 1903.

AROMATIC sulphonic acid esters of cresols, obtained by the action of an aromatic sulphonic chloride on a dilute alkaline solution of a cresol, are oxidised to the corresponding sulphonic esters of hydroxybenzaldehyde and hydroxybenzoic acid by means of manganese dioxide and sulphuric acid. 500 parts of the benzenesulphonic acid ester of o-cresol are mixed, at 100° C., with 300 parts of manganese dioxide and 800 parts of 70—80 per cent. sulphuric acid; the mixture is agitated for four or five hours at the same temperature, and diluted with about 900 parts of water and allowed to stand in a warm place. The oily product which separates is mixed with cold, dilute caustic soda solution, filtered, and acidified, when the benzene sulphonic acid ester of salicylic acid separates. "The reaction product remaining undissolved" is mixed with bisulphite solution, and the aldehyde-bisulphite compound decomposed by means of alkali, the benzenesulphonic ester of salicylic aldehyde being obtained. These esters are easily saponified to the corresponding hydroxy acids and hydroxy aldehydes.

—T. F. B.

Pinene Hydrochloride; Purification of —. F. Lienau (Chem. Fabr. Uerdingen, Lienau, and Co.) and W. Naschold, Uerdingen-on-Rhine, Germany. Eng. Pat. 14,189, June 25, 1903.

SEE Fr. Pat. 328,009 of 1902 and addition thereto; this J., 1903, 1101, and 1904, 336.—T. F. B.

UNITED STATES PATENTS.

Isoionone; Homologues of —, and Process of Making same. R. Schmidt, Assignor to Haarmann and Reimer, Chem. Fabr. zu Holzminden, G. m. b. H., Holzminden, Germany. U.S. Pat. 762,765, June 14, 1904.

ISOMERS of cyclic homoionones are obtained by treating a mixture of cyclocitral (or its isomers) and "homologous ketones" with condensing agents; the resulting compounds possess the odour of violets and orris (See Ger. Pat. 116,657 of 1898; this J., 1901, 150).—T. F. B.

Saponin, and Process of Making same. R. Kobert, Rostock, Assignor to Firm of E. Merck, Darmstadt. U.S. Pat. 763,003, June 21, 1904.

GALUACUM extract containing saponin is treated with lead acetate, thereby precipitating the lead salt of the acid saponin; the neutral saponin is precipitated as its lead salt,

by treating the filtrate with lead subacetate; neutral saponin is obtained from its lead salt, by treatment with sulphuretted hydrogen, in the form of a powder soluble in alcohol, but insoluble in ether, and precipitated from its aqueous or alcoholic solution on addition of ammonium sulphate.—T. F. B.

Extracts; Process of Increasing the Solubility of —.
J. Maggi, Paris. U.S. Pat. 764,483, July 5, 1904.

SEE Fr. Pat. 330,691 of 1903; this J., 1903, 1078.—T. F. B.

FRENCH PATENT.

Glucinium Hydroxide; Process for Obtaining Pure —.
G. van Oordt. Fr. Pat. 340,027, Jan. 29, 1904.

By digesting a mixture of the hydroxides of glucinium, aluminium, and iron, with water, dilute ammonia, &c., or with insufficient alkali hydroxide solution to dissolve the hydroxides, the glucinium hydroxide is rendered very insoluble in acids and dilute alkalis; if the iron be then removed by means of acid, and the alumina by long heating with just sufficient alkali hydroxide, fairly pure glucinium hydroxide is obtained; this can be further freed from traces of iron and aluminium hydroxides by dissolving in acetic acid, evaporating the solution to dryness, treating with glacial acetic acid, again evaporating to dryness, and extracting the iron and aluminium acetates by means of water, and then extracting the pure glucinium acetate by means of chloroform.—T. F. B.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Silver; Influence of the Character of Developers on the Size of Grain of Reduced —. A. and L. Lumière and A. Seyewetz. Brit. J. Phot., 1904, 51, 630—631.

THE size of the grain of reduced silver, as produced by the various developers in common use, is practically invariable, and temperature (between 5° and 35° C.) and concentration of the developer would appear to be without influence also; very protracted development tends to cause a diminution in the size of the grain, whilst excess of alkali or alkali bromide produces a very slight enlargement of the grain. Feeble developers, such as *p*-phenylenediamine or *o*-aminophenol, when used with sodium sulphite, produce a deposit similar to that obtained with collodion emulsions, and of a much finer grain than that given by the other developers; on addition of alkali carbonate, however, the size of the grain increases until the "normal" composition of developer is reached, when the size and appearance of the grain are almost identical with those produced by other developers.

—T. F. B.

Potassium Metabisulphite and Sodium Bisulphite; Alteration of — when exposed to Air. A. and L. Lumière and A. Seyewetz. Brit. J. Phot., 1904, 51, 645—646.

SOLID potassium metabisulphite is not appreciably altered on exposure to air, even at a temperature of 100° C. In solution, gradual oxidation occurs, the rate of decomposition being greater the more dilute the solution; the solutions are much more stable than those of sodium sulphite of the same strength (see this J., 1904, 488), a 1 per cent. solution of the latter being totally oxidised after one week, whilst a 1 per cent. solution of potassium metabisulphite is only oxidised to the extent of about 22 per cent. after three weeks; in the more concentrated solutions the difference is less marked, though very apparent. Crystallised sodium bisulphite deteriorates rather rapidly on exposure to air, the decomposition being more rapid in moist air. In solution, the salt behaves very similarly to potassium metabisulphite. On the whole, however, anhydrous or normal sodium sulphite seems most suitable for photographic use, since the use of metabisulphite necessitates the addition of measured quantities of alkali at the time of development.—T. F. B.

ENGLISH PATENT.

Pictures or the like by Aid of Catalysis; Reproduction of —. A. G. Bloxam, London. From the Neue Photographische Gesellschaft, Berlin. Eng. Pat. 18,370, Aug. 25, 1903.

THE present invention consists in substituting a stable catalyst for the silver in negatives. For this purpose the negative is treated with either (1) a solution of manganic hydroxide in tartaric acid, afterwards rendered alkaline with sodium hydroxide; (2) a solution of potassium permanganate mixed with an excess of sodium tartrate; (3) a solution of potassium permanganate and tartaric acid rendered alkaline with sodium hydroxide; or (4) a saturated solution of sodium tartrate in which is dissolved a mixture of potassium permanganate and manganous sulphate. The negative or picture is then washed for a short time and brought into a solution of potassium ferriocyanide and sodium hydroxide. The negative thus obtained is well suited for catalytic multiplication by means of hydrogen peroxide. After long use its activity may be restored by means of ammonia vapour.—W. P. S.

FRENCH PATENT.

Photographic Papers; Process for the Preparation of —. I. Hoffsummer. Addition, dated Feb. 3, 1904, to Fr. Pat. 336,873, Nov. 21, 1903.

SEE Eng. Pat. 3855 of 1904; this J., 1904, 622.—T. F. B.

XXII.—EXPLOSIVES, MATCHES, Etc.

ENGLISH PATENT.

Explosives. H. H. Lake, London. From Dynamit-Act.-Ges., vorm. A. Nobel and Co., Hamburg. Eng. Pat. 14,825, July 3, 1903.

SEE Fr. Pat. 333,443 of 1903; this J., 1903, 1367.—T. F. B.

UNITED STATES PATENT.

Nitrating Fibrous Matter; Process of —. J. Selwig, Brunswick. U.S. Pat. 764,776, July 12, 1904.

SEE Fr. Pat. 327,802 of 1902; this J., 1903, 963.—T. F. B.

XXIII.—ANALYTICAL CHEMISTRY.

INORGANIC—QUANTITATIVE.

Arsenic; Electrolytic Methods for the Detection and Determination of Minute Quantities of — in Beer, Malt, Foodstuffs, &c. W. Thomson. Memoirs and Proc. Manchester Lit. and Phil. Soc., 1904, 48, Part III.

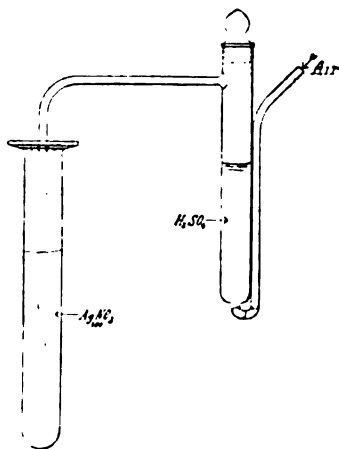
THE apparatus designed by the committee appointed by the Commissioners of Inland Revenue for the electrolytic detection and determination of arsenic does not, in the author's hands, produce a mirror when less than $\frac{1}{100}$ grain of arsenic per gallon is present, using 50 c.c. of the solution. With a cathode composed of granulated zinc, connected with the battery by a platinum wire, much better results were obtained, but, when working with 0.001 gr. per gall. the mirror produced was not so intense as that obtained with the Marsh-Berzelius method. The form of apparatus ultimately adopted, and which gave mirrors of equal intensity to those obtained with the Marsh-Berzelius apparatus, consists of a porous pot, 3 ins. high by 1½ in. diameter, surrounded, as in the "Committee's" apparatus, by a band of platinum foil, which serves as anode. A glass stopper is ground into the top of the porous pot, and is provided with two openings; through one of these, the narrowed end of a zinc rod projects, and is connected with the negative pole of the battery; the other opening serves both for introducing the liquid to be tested and as an exit for the hydrogen. The whole apparatus is placed in a glass beaker, about $\frac{1}{2}$ in. more in diameter than the external diameter of the porous pot, thus necessitating the use of only a small amount of sulphuric acid. In other respects, the apparatus is similar to that devised by the "Committee."

It is found that a current of 3 ampères is preferable to one of 5 ampères, as the mirrors obtained with the former are less spread out over the tube, and therefore easier to compare. Experiments showed that all the arsenic was collected in the form of a mirror 40 minutes after the introduction of the liquid, and that, with this form of apparatus, arsenic as well as arsenious compounds were completely reduced without addition of metabisulphite. A series of experiments showed that the addition of amyl alcohol to prevent frothing (as recommended by the Committee) resulted in the formation of smaller deposits of arsenic than when no amyl alcohol was used; in fact, an experiment with as much arsenic as is permissible in beer (50 c.c. of a solution containing $\frac{3}{16}$ gr. of arsenious oxide per gallon) no mirror was produced when amyl alcohol was added. Glucose was also found to have a marked influence in preventing the formation of mirrors. It is concluded that, in using 25 c.c. of beer, as recommended, and destroying organic matter, a very faint mirror is produced from beer containing 0.01 gr. per gallon, but when beer is used direct with amyl alcohol, no mirror is produced, and therefore the direct method fails to detect an amount of arsenic considerably greater than that which the committee regard as sufficient to condemn the sample.

—T. F. B.

Barium Sulphate; Chlorine in precipitated —. G. A. Hulett and L. H. Duschalk. *Z. anorg. Chem.*, 1904, 40, [2], 196—217.

THE "occlusion" of barium chloride by precipitated barium sulphate, and its non-removal by calcining, extracting with acids, and washing with water, has so far been quantitatively investigated only by Richards and Parker (*Amer. Acad. Sci.*, 31, (1896), 67), the determination of the amount of chlorine present being very difficult. The authors make use of the fact that barium sulphate is completely soluble in concentrated sulphuric acid, and loses any chlorine present, when a current of air is aspirated through the solution. To test the method, some barium chloride ($\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$) was weighed into the small stoppered tube (see figure), pure concentrated sulphuric acid free from hydrochloric acid added, and a stream of purified air bubbled through the apparatus. The hydrochloric acid liberated was absorbed in a dilute solution of silver nitrate, and the silver chloride weighed in a Gooch crucible. The hydrochloric acid is recovered quantitatively. Barium sulphate precipitates were prepared by precipitation with sulphuric acid from solutions of barium chloride containing a constant quantity of hydrochloric acid, and from solutions rendered alkaline by the simultaneous addition of



barium hydroxide solution. The chlorine present in the precipitates was determined, and found to be 0.27—0.64 per cent. in the case of the hydrochloric acid solution, and 0.158 per cent. in the case of the alkaline solution, 0.096 per cent. of this latter being volatile. Barium sulphate precipitated from barium hydroxide solution with sulphuric

acid does not "occlude" chlorine after shaking for 20 days with a solution of barium chloride. On heating precipitated barium sulphate between 300° and 650° C. it loses water and volatile chlorine. Between 650° and 900° C. the residue consists of barium sulphate and barium chloride. On further heating between 900° and 1100° C. it again loses in weight, and the residue shows an alkaline reaction. All the determinations were carried out in platinum or Jena glass vessels, the barium sulphate in the wash waters was recovered, and all weighings reduced to vacuum. The authors consider the "occlusion" of chlorine in the precipitates to be due to the presence of HSO_4^- and BaCl^+ ions in the solution, causing the precipitation of $\text{BaCl} \cdot \text{HSO}_4$. They confirmed this by precipitating barium platinumocyanide, $\text{BaPt}(\text{CN})_4$, solution with magnesium sulphate solution, when the theoretical quantity of barium sulphate was obtained. They recommend the calcining of barium sulphate precipitates at 700° C. and subsequent determination of the barium chloride present.—L. F. G.

Sulphur in Iron; Rapid Method for the Determination of Total — by Evolution. S. S. Knight. *Amer. Chem. J.*, 1904, 32, 84—85.

Two grms. of the sample of iron, mixed with 1 gm. of pure iron-dust, are placed in a porcelain crucible and covered with a layer of 1 gm. of iron dust. The whole is covered with a disc of filter paper, the crucible lid is put in place, and the contents roasted strongly for ten minutes by means of a blow-pipe flame. When nearly cool, the mass is decomposed by hydrochloric acid, and the evolved gases passed through a standard solution of cadmium chloride, which is subsequently titrated with standard iodine solution. The results obtained by this method (which occupies less than half an hour) agree closely with those obtained by slower methods, which have been proved to be accurate.—T. F. B.

ORGANIC—QUALITATIVE.

Digitalin; Detection of —. C. Binz. *Arch. internat. de Pharmacod.*, 1904, 12, 337. *Biochem. Centralbl.*, 1904, 2, 701.

GRANDEAU's test (purple coloration with concentrated sulphuric acid and bromine water) did not give the characteristic coloration with Merck's "crystalline digitalin" and "crystalline digitoxin," whereas, on the other hand, very similar colorations were obtained with helioborein, strophanthin, convallamarin, erythroplein, euonymin, cyclamin, delphinin, saponin, silicin, amygdalin, benzaldehyde, peronin, turpentine oil, terpene hydrate, abietic acid (crystalline), camphor, menthol, cubebin, solanine, brucine, cytosine, veratrine, and agaricine. In the case of Trapp's reaction (reduction of phosphomolybdic acid on heating, with the formation of a green coloration turning blue on the addition of ammonia) positive results were obtained with all the digitalin preparations tried, although in some cases only after prolonged heating, whilst digitoxin in alcoholic solution only reacted after vigorous heating and long-continued cooling. The coloration was also obtained with helioborein, strophanthin, scillitoxin, convallamarin, cyclamin, delphinin, saponin, ricin, morphine, heroine, peronin, strychnine, brucine, aniline, and phenacetin. The author concludes that if both tests give negative results, the absence of digitalin is certain, but that if the characteristic colorations be obtained, the absence of the other substances named must be assured.—C. A. M.

ORGANIC—QUANTITATIVE.

Coal Analysis; A Frequent Cause of Error in —. J. Alix and J. Bay. *Comptes rend.*, 1904, 139, 215—216.

COAL nearly always contains considerable amounts of calcium carbonate, six samples tested showing a mean of 4.99 per cent., corresponding to 2.06 per cent. of carbon dioxide. When the coal is incinerated to determine the carbon content, a correction must therefore be made for the carbon dioxide arising from calcium carbonate, as otherwise the carbon content would not give accurate indication of the fuel value of the coal.—T. F. B.

Margarine; Characteristic Values of — E. Russell, and V. H. Kirkham. Analyst, 1904, 29, 206—208.

THIRTEEN samples of commercial margarine examined by the authors gave the following results:—Valenta test ($^{\circ}\text{C}$. 62 to 96; Reichert value (7 samples), 0.5 to 5; water (6 samples), 9.9 to 18.7 per cent.; butyro-refractometer reading (10 samples), $+2.7$ to $+9.4$; oleo-refractometer reading (9 samples), -4 to -22 ; and iodine value, (4 samples), 48.5 to 79.8. They conclude from their results: (1) That Valenta figures above 89°C . are obtained when not more than traces of butter-fat or cotton-seed oil are present, butter-fat causing the greater depression. (2) That the presence of butter-fat reduces the butyro-refractometer and oleo-refractometer readings, whilst vegetable oil increases them. (3) That similar conclusions can be drawn from the iodine value. In the authors' opinion the amount of water and vegetable oil in margarine should be legally fixed.—C. A. M.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Radium; Origin of — H. N. McCoy. Ber., 1904, 37, 2641—2656.

RADIO-ACTIVE substances are usually divided into those exhibiting permanent and those exhibiting temporary activity. The loss of activity is usually ascribed to change of chemical constitution. Sometimes two or more stages are passed through (the radium-emanation giving rise to the α -emanation, for example), but ultimately an inactive substance results. The permanence of the activity of the three so-called permanently active substances, uranium, thorium, and radium, is perhaps open to doubt. For, on the one hand, quantitative measurements of radio-activity are not very exact, and, such as they are, have only been made during a very few years; and, on the other, indications, if not proofs, of the slow decline of "permanent" activity are given by (1) the fact that at least the α - and β -radiations are material; (2) the proof, given by Rutherford and Soddy, that uranium- α (of temporary activity) is not an accidental impurity in uranium, but is generated from it, and that its rate of loss of activity indicates a "mono-molecular reaction," i.e., is proportional to its quantity; so that, though its mass is so small compared with that of the generating uranium that the latter may be considered as practically constant, yet it is undergoing loss in producing uranium- α , and that loss must become evident in time. The same is shown by the proof of Ramsay and Soddy that the ultimate transformation product of the radium-emanation is helium. (3) The almost certainty that radio-activity is not the result of external stimulation. As to the rate of loss of "permanent" radio-activity, Rutherford has estimated that in the case of radium the loss may be $1/1,000$ th of the total mass in a year, and in that of thorium about $1/1,000,000$ th as large. If that be so, many ages would be required for the final disappearance of radium from the earth, if it once existed in considerable quantity; while its present existence may be due to its being constantly formed from some much more slowly transforming substance to which radium would bear the same relation that uranium- α does to uranium. In theory, if a series of substances were transformable successively into one another— $A \rightarrow B \rightarrow C \rightarrow \dots \rightarrow N$, the rate of transformation being in each case proportional to the mass of the transforming substance, then if the mass of A be supposed constant, B will be formed at a steady rate, but will decompose at a rate increasing with its quantity, till that rate rises to the rate of its formation; then its mass will be constant. The same will occur with C; and ultimately, if equilibrium is reached, the masses of B, C, &c. will be $\frac{k_a}{k_b} A$, $\frac{k_a}{k_c} A$, &c., where $k_a k_b$, &c. represent the amounts of A, B, &c., transformed from unit mass in unit time. The amount of B, for instance, formed after any time t from the beginning, is $\frac{k_a}{k_b} A (1 - e^{-k_b t})$; an expression exactly similar to that deduced by Rutherford and Soddy for the radio-activity produced by the formation of ThX in a thorium preparation. This last expression enables the time required

for the production of any given fraction of the maximum or equilibrium-production of the substance concerned, to be deduced; thus for 99 per cent. and 99.9 per cent. of the maximum, the times required are $\frac{4.6}{k}$ and $\frac{6.9}{k}$. These times are inversely as the rates (k) of transformation; and a maximum will be practically reached in a very short time, in any case in which the transformation-rate of the product is very great compared with that of the mother-substance. Applying this to radium, from the figure above given, we get t (for 99 per cent. of the maximum) = 4,600 years; so that any radium-containing mineral over 5,000 years old probably now contains practically its maximum amount of radium (on the assumption that k for the mother-substance is so small compared with k for radium that the mass of the former may be considered constant). The frequent association of radium with uranium-minerals, coupled with the fact that uranium is radio-active, and is probably transforming, though very slowly as compared with radium, suggest that uranium is possibly the mother-substance of radium. If this be so, all uranium minerals should contain radium, in amount proportional to their uranium-content. The author has examined 12 very different uranium minerals, and finds this to be very nearly the case, the figures representing the quotient of radio-activity by percentage of uranium varying from 18.9 to 24.7, with an average of 22.1. Pure uranium compounds gave a corresponding average figure (with greater variations, due no doubt to difficulties of purification) of 3.86; so that the old minerals, containing besides uranium their maximum amounts of its transformation products, are 5.7 times as active as the new uranium preparations. Apparently then, we have the series $U \rightarrow UX \rightarrow Ra \rightarrow RaEm \rightarrow EmX \rightarrow He$, with possibly other end- or intermediate members. The transformation-rates of UX, RaEm, and EmX are vastly greater than that of radium; hence the amounts of these bodies present in the minerals are much smaller than that of radium. The activity of radium may be taken at $1\frac{1}{2}$ million times that of uranium; and since the activity of radium in uranium minerals is $(5.7 - 1 =) 4.7$ times that of the uranium present, there should be about 1 part of radium to 800,000 of uranium in these minerals—a result agreeing well with those of experiment.—J. T. D.

Minerals; Examination of different — with respect to Radio-activity, by the Photographic Method. F. Kolbeck and P. Uhlich. Centr.-Bl. f. Min. u. Geol., 1904, 206—208. Chem. Centr., 1904, 1, 1632.

THE authors find that the uranium pitchblende from the Vereinigt-Feld mine at Johanngeorgenstadt is more active than the Joachimstal ore. Other strongly active ores are uranotite and carnotite from Neustädte - Schneeberg, orangite from Brevig, Norway, and monazite from Moss, Norway.—A. S.

Metals; Action of Radium on — N. Orloff. J. russ. phys.-chem. Ges., 36, 41—45. Chem. Centr., 1904, 1, 1639.

AN aluminium plate, 0.1 mm. thick, which had been covered for some months with a small receptacle containing "0.03 grm." of radium bromide, was found to have numerous small globules of apparently fused metal on its under side. These protuberances were radio-active, and their activity was not diminished by seven months' exposure to the air, by washing the plate with alcohol, ether, or boiling water, nor by heating in a thermostat to 320°C .

—A. S.

Acid Sulphates; Decomposition of some — in Consequence of Mechanical Deformation. W. Spring. Bull. Acad. roy. Belg., 1904, 290—309. Chem. Centr., 1904, 1, 1630—1631.

A NUMBER of acid sulphates, both in the anhydrous condition and containing water of crystallisation, were subjected to the action of strong pressure, with deformation, in a steel cylinder having a small hole in the bottom. Lithium hydrogen sulphate (lithium anhydrosulphate) was separated in this way into a constituent richer in acid (approximating to the composition, $9\text{LiHSO}_4 \cdot 2\text{H}_2\text{SO}_4$) which flowed through

the opening, and a residual portion nearly of the composition of the normal sulphate. With the salt $\text{LiHSO}_4 \cdot \text{H}_2\text{O}$, water also was separated. No distinct action was observed with sodium hydrogen sulphate (sodium anhydrous sulphate) but with the various hydrates of this salt, especially at a somewhat higher temperature, large quantities of the water of crystallisation and a considerable amount of sulphuric acid were separated; at lower temperatures the water separated first. The acid sulphates of potassium, rubidium, and caesium remained practically unaffected by the action of pressure. In a further series of experiments, mixtures of sodium hydrogen sulphate (anhydrous sulphate) with various basic oxides (PbO , CuO , HgO , Ag_2O) were subjected to strong pressure. In completely closed cylinders no reaction took place, but when the pressure was accompanied by mechanical deformation, i.e., when there was a small hole in the bottom of the cylinder, chemical reaction ensued until the acid contained in the acid salt was completely neutralised. A similar action is brought about by merely rubbing the two compounds together; e.g., copper oxide forms a white compound, $\text{CuSO}_4 \cdot \text{Na}_2\text{SO}_4 \cdot \text{H}_2\text{O}$. (See also this J., 1904, 374).—A. S.

Nitrogen; Solubility of — in Liquid Oxygen.

E. Erdmann and F. Bedford. Ber., 1904, 37, 2545—2550.

A REPLY to Stock (this J., 1904, 489). The authors' paper (ib. 441) described purely experimental work. No detailed description of the preparation of liquid oxygen was available, and experimenters had lamented the difficulty of obtaining it in quantity sufficient to work with; hence the publication of their method. The solubility of nitrogen in liquid oxygen below its boiling point was experimentally established by the authors. Oxygen boiling in a vessel open to the air does not absorb nitrogen, but if a stream of nitrogen or air be passed through the boiling oxygen, nitrogen is absorbed by the oxygen. As the result of experiments, the authors admit the probability of Stock's view, that by the passage of the current of nitrogen the temperature of the boiling oxygen is reduced below the boiling point, so that the absorption of nitrogen really occurs slightly below that point.—J. T. D.

Sugars; Action of Benzylphenylhydrazine on —.

R. Ofner. Ber., 1904, 37, 2623—2625.

THE statement of Neuberg to the effect that only ketoses yield osazones with secondary hydrazines has been refuted by Goldschmidt, who found that with benzylphenylhydrazine, dextrose yields the same osazone as levulose. The author shows that neither dextrose nor levulose reacts with pure benzylphenylhydrazine, and that the compound obtained by Neuberg and by Goldschmidt is phenylbenzylphenyldextrosazone, $\text{C}_{23}\text{H}_{28}\text{O}_4\text{N}_4$, the formation of which is due to the presence of phenylhydrazine in commercial benzylphenylhydrazine. This compound may also be prepared by the action of pure benzylphenylhydrazine on phenyldextrosazone.—T. H. P.

Enzymes that decompose Amides; Occurrence of — in Mould-Fungi.

K. Shibata. Hofmeisters Beitr., 1904, 5, 385. Biochem. Centralbl., 1904, 2, 651.

THE mycelia of *Aspergillus niger* were pressed and triturated, or treated with acetone as in the method of Albert and Buchner, and then brought in contact with the amides under examination. The following amides were decomposed:—Urea, biuret (slightly), acetamide, oxamide, and asparagine (very slightly), whilst small amounts of ammonia were liberated from the amino acids, alanine and tyrosine. Hippuric acid was decomposed with the formation of glyco-coll. The following were not attacked:—Urethane, guanidine, allantoin, uric acid, and benzamide. The author suggests the name *amidases* for this class of enzymes.

—C. A. M.

IX. Peroxydase Reaction; Velocity of the —. Peroxides; Function of — in the Chemistry of Living Cells.

A. Bach and R. Chodat. Ber., 1904, 2434—2440. (See also this J., 1904, 766.)

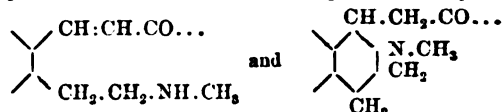
FOR determining the velocity of this reaction, the authors made use of the oxidation of hydriodic acid by peroxydase

and hydrogen peroxide, the course of the reaction being ascertained by titration with thiosulphate solution. The results show that the peroxydase, in rendering active the hydrogen peroxide during the oxidation, is used up, as was found to be the case in the oxidation of pyrogallol (this J., 1904, 505). In the present experiments the peroxydase exhibited a much greater activity than it did in the pyrogallol reaction. The velocity of the peroxydase reaction was found to follow the law of mass, in so far as it was not inhibited by the secondary products formed. The authors consider that peroxydase is a ferment. It differs from other ferments in being completely and quickly used up during the process of rendering hydrogen peroxide active, but, on the other hand, its origin, preparation, and general properties are similar to those of other ferments. Its mass-reaction, when not interfered with, is also common to rennet-ferment, invertase, and catalase.—W. P. S.

Couartnine and Hydrastinine; Condensation of — with Ketones.

C. Liebermann and A. Glawe. Ber., 1904, 37, 2738—2744. Compare this J., 1904, 202.

COTARNINE and hydrastinine form condensation products not only with ketones and with most compounds containing methylene carbons between carbonyl groups, but also with many other compounds, such as quinol (hydroquinone), phloroglucinol, and pyrogallol. Descriptions are given of the condensed products formed with ethyl phenylacetate, ethyl malonate, cumarone, and resorcinol, and of some of the derivatives of these products. Attempts were made, but without success, to combine the two bases with meconine and so obtain narcotine and hydrastine. Many of these condensation products, for example, those formed from ethyl malonate, decompose so readily into their components that these latter are obtained in even the simplest changes. With others, however, it is necessary to employ such vigorous agents as boiling mineral acids in order to decompose them, but in all cases the decomposition yields the components from which they were obtained. Some of these products are more readily obtained when piperidine is used as condensing agent in place of sodium carbonate. There are two possible constitutions for these compounds, namely:—



the CH.CO... or $\text{CH}_2\text{CO...}$ representing the ketone residue. For compounds containing methylene carbon atoms the first of these, and for others probably the second, represents the constitution.—T. H. P.

New Books.

CHEMICAL TECHNOLOGY AND ANALYSIS OF OILS, FATS, AND WAXES. By Dr. J. LEWKOWITSCH, M.A., F.I.C. Third Edition, entirely rewritten and enlarged. In two volumes. Macmillan and Co., Ltd., London. 1904. Price 36s. net. The Macmillan Company, New York.

TWO 8vo volumes, Vol. I. containing 427 pages of subject-matter, numerous tables, and 58 illustrations; and Vol. II., 709 pages of subject-matter, tables, and 35 illustrations. Total pages of matter are therefore 1136, with 88 illustrations. The alphabetical index follows at the close of Vol. II.

The leading subjects treated of in Vol. I. are the following:—I. Classification of Oils, Fats, and Waxes, with their Physical and Chemical Properties. II. Saponification of Fats and Waxes. III. Constituents of Fats and Waxes. IV. Preparation of the Fatty Matter for Examination. Preliminary Tests. V. and VI. Physical and Chemical Methods of Examining Oils, Fats, and Waxes. VII. Their Qualitative Examination. VIII. Examination of the Mixed Fatty Acids. IX. Examination of Unsaponifiable Matter.

X. Detection and Quantitative Determination of Rosin. XI. Application of Foregoing Methods to the Systematic Examination of Oils, Fats, and Waxes. XII. Examination by strictly Scientific Methods.

The leading subjects treated of in Vol. II. are as follows:— XIII. Commercial Preparation of Oils, Fats, and Waxes. XIV. Description of the Natural Oils, Fats, and Waxes; also Methods of Preparing and Examining them and Detecting Adulterations. A. OILS AND FATS. GLYCERIDES. 1. Oils or Liquid Fats. II. Solid Fats. B. WAXES. 1. Liquid Waxes. II. Solid Waxes. XV. Technology of Oils, Fats, and Waxes; Technical and Commercial Examination of the Products of the Oil and Fat Industries. A. Industries having for their Object the Refining of Oils and Fats. B. Industries wherein Glycerides undergo chemical change, but are not saponified. C. Industries based on the Saponification of Oils and Fats. 1. Candle Industry. II. Soap Manufacture. III. Glycerin Manufacture. XVI. Technology of Waste Fats. 1. Greases. 2. Cotton-seed Foots. 3. Fuller's Grease. 4. Black (recovered) Oil. 5. Wool Grease. 6. Sod Oil, Dégras. 7. Stuffing Greases. 8. Garbage Fats, Sewage Fats.

CHEMISCH-TECHNISCHE UNTERSUCHUNGSMETHODEN. Mit Benutzung der früheren von Dr. Friedrich Böckmann bearbeiteten Auflagen, und unter Mitwirkung von E. Adam, F. Barnstein, Th. Beckert, O. Böttcher, C. Connelier, K. Dieterich, K. Dümmler, E. Ebertz, C. von Eckenbrecher, F. Fischer, F. Frank, H. Freudenberg, E. Gidemeister, R. Gnehm, O. Guttman, E. Haselhoff, W. Herzberg, D. Holde, W. Jettel, H. Köhler, Ph. Kreiling, K. B. Lehmann, J. Lewkowitzsch, C. J. Lintner, E. O. v. Lippmann, E. Marckwald, J. Messner, J. Pässler, O. Pfeiffer, O. Pufahl, H. Rasch, O. Schluttig, C. Schoch, G. Schüle, L. Tietjens, K. Windisch, L. W. Winkler. Herausgegeben von Dr. GEORG LUNGE. Erster Band. Fünfte vollständig umgearbeitete und vermehrte Auflage. Julius Springer's Verlag, Berlin. 1904. Price M. 20.

LARGE 8vo volume, containing 933 pages of subject-matter, with 180 illustrations, and an Appendix with 49 pages of tables. The subject-matter treated of in this first volume is as follows:— I. GENERAL PORTION (G. Lunge). General Operations: (i) Sampling; (ii) Laboratory Work. SPECIAL SECTION. Technical. GAS ANALYSIS (Ferd. Fischer). FUEL DETERMINATIONS (F. Fischer). MANUFACTURE OF SULPHUROUS ACID, NITRIC ACID, AND SULPHURIC ACID. SALTCAKE AND HYDROCHLORIC ACID MANUFACTURE, AND SODA MANUFACTURE. CHLORINE INDUSTRY (G. Lunge). POTASH SALTS (L. Tietjens). CYANOGEN COMPOUNDS (H. Freudenberg). INVESTIGATION OF EARTHENWARES (K. Dümmler). ALUMINA PREPARATIONS (G. Lunge). GLASS (E. Adam). MORTAR INDUSTRY (Carl Schoch). WATER (L. W. Winkler). TESTING WATER FOR BOILER FEEDING, &c. (G. Lunge). SEWAGE AND EFFLUENTS (E. Haselhoff). SOILS (E. Haselhoff). THE ATMOSPHERE (K. B. Lehmann).

MINERAL RESOURCES OF THE UNITED STATES. (Department of the Interior, United States Geological Survey. Chas. D. Walcott, Director.) Calendar year 1902. DAVID T. DAY, Chief of Division of Mining and Mineral Resources. Washington, U.S.A., Government Printing Office. 1904.

8vo volume containing "Letter of Transmittal," Introduction, and 1,016 pages of subject-matter with six illustrations, and the alphabetical index of subjects. The following are the items on which geographical and industrial details are given:— I. Iron Ores: (i) Statistics of the American Iron Trade for 1902; (ii) General Statistics of Iron and Steel, Iron Ore, and Coal, to the year 1901 inclusive, for five leading Iron and Steel Producing Countries. II. Gold and Silver. III. Manganese Ores. IV. Copper. V. Lead. VI. Zinc. VII. Aluminium and Bauxite. VIII. Platinum. IX. Mercury. X. Lithium. XI. Nickel and Cobalt. XII. Antimony. XIII. Arsenic. XIV. Bismuth. XV. Tungsten; Molybdenum; Uranium; Vanadium. XVI. Coal. XVII. Coke. XVIII. Gas, Coke, Tar, and Ammonia at Gas Works, and in Retort Coke Ovens.

XIX. Petroleum. XX. Natural Gas. XXI. Asphaltum and Bituminous Rock. XXII. Stone. XXIII. Clay-working Industries. XXIV. Cement. XXV. Precious Stones. XXVI. Talc and Soapstone. XXVII. Abrasive Materials. XXVIII. Borax. XXIX. Bromine. XXX. Fluorspar and Cryolite. XXXI. Gypsum. XXXII. Phosphate Rock. XXXIII. Salt. XXXIV. Sulphur and Pyrites. XXXV. Barytes. XXXVI. Mineral Paints. XXXVII. Asbestos. XXXVIII. Chromite. XXXIX. Flint and Felspar. XL. Graphite. XLI. Magnesite. XLII. Mica. XLIII. Mineral Waters. XLIV. Monazite. XLV. Glass Sand.

SPECIAL TECHNICAL SCHOOLS FOR THE CERAMIC INDUSTRIES IN GERMANY. Foreign Office Miscellaneous Series, No. 615. Eyre and Spottiswoode. Price 1½d.

A REPORT on the aims, organisations and plans of instruction in the technical schools for the ceramic industries at Höhr, Dünzlau, and Landshut, and the technical school for brick-making industries at Lauban.

IRON AND STEEL, 1903. STATISTICAL TABLES. 244. Eyre and Spottiswoode. Price 3d.

THIS memorandum, which has been drawn up in the Commercial, Labour, and Statistical Department of the Board of Trade, deals with the production and consumption, during the 13 years 1890 to 1902 (and where possible to 1903), of iron ore and pig iron, and the production of steel in the United Kingdom, and in the principal foreign producing countries, viz., Russia, Sweden, Germany (including Luxemburg), Belgium, France, Spain, Italy, Austro-Hungary, and the United States of America.

Trade Report.

I.—GENERAL.

CANADIAN TARIFF CHANGES.

Bd. of Trade J., July 21, 1904.

A Customs Memorandum (No. 1,287 B), issued by the Canadian Commissioner of Customs on 28th June 1904, gives the details of the Tariff Resolutions proposed by the Canadian Minister of Finance in Committee of Ways and Means on 7th June 1904, as amended on 28th June 1904.

The following are some of the amendments effected thereby:—

New Rates of Duty.

Paraffin-wax candles, 25 per cent. *ad valorem*.

Paraffin wax, 25 per cent. *ad valorem*.

Illuminating oils, composed wholly or in part of the products of petroleum, coal, shale, or lignite, costing more than 30 c. per gall., 20 per cent. *ad valorem*.

Lubricating oils, composed wholly or in part of petroleum, costing less than 25 c. per gall., 2½ c. per gall.

Crude petroleum, gas oils (other than benzine and gasoline) above 0.775 but below 0.8235 sp. gr. at 60° temperature, 1½ c. per gall.

Oils, coal and kerosene distilled, purified or refined, naphtha and petroleum, and products of petroleum n.e.s., 2½ c. per gall.

Lubricating oils n.e.s., and axle-grease, 20 per cent. *ad valorem*.

Vaseline, and all similar preparations of petroleum for toilet, medicinal, or other purposes, 25 per cent. *ad valorem*.

Duty Free.

The following articles now dutiable to be transferred to the free list:—

Whale-oil soap.

Plain basic photographic paper, baryta coated, for albuminising or sensitising.

Hydrofluosilicic acid.

Glass cut to size for the manufacture of dry plates for photographic purposes, when imported by the manufacturers of such dry plates for use exclusively in the manufacture thereof in their own factories.

Ferment-cultures to be used in butter-making.

Quassia juice.

Crude petroleum, fuel and gas oils, 0·8233 sp. gr. or less, at 60° temperature.

Philosophical and scientific apparatus, utensils, instruments, and preparations, including boxes and bottles containing the same, of a class or kind not manufactured in Canada, when especially imported in good faith for the use and by order of any society or institution incorporated or established solely for religious, philosophical, educational, scientific, or literary purposes, or for the encouragement of the fine arts, or for the use or by order of any college, academy, school, or seminary of learning in Canada, and not for sale, subject to such regulations as the Minister of Customs shall prescribe.

GERMANY; TRADE OF — IN 1903.

Foreign Office Annual Series, No. 3221.

The following tables show the value of some of the imports and exports of Germany for the year 1903, as compared with those of the year 1902. The figures for 1903 are calculated according to the prices fixed for 1902:—

Articles.	Value in 1,000 Marks (50 <i>l.</i>).			
	Imports.		Exports.	
	1902.	1903.	1902.	1903.
Lead and leaden goods..	9,083	12,200	14,216	16,968
Drugs and dyes.....	263,302	267,407	380,639	400,149
Iron and iron goods.....	51,828	57,221	603,375	653,253
Ores, fine metals, asbestos, &c.....	355,661	522,897	206,366	192,840
Glass and glassware	6,689	9,316	48,005	52,008
Hides.....	258,905	292,382	137,402	123,473
Caoutchouc, gutta-percha, and goods thereof.....	73,263	76,253	50,000	52,815
Copper and copper goods	109,011	120,623	120,236	142,403
Leather and leather goods.....	64,378	66,542	153,363	164,849
Candles.....	194	187	819	864
Oils, not otherwise mentioned, and fats.....	261,102	258,288	47,189	50,122
Paper and cardboard goods.....	15,207	18,447	109,322	129,431
Petroleum.....	93,109	101,232	1,459	1,885
Soap and perfumery	2,708	2,725	17,054	20,363
Stones and earthenware.	45,154	44,724	38,084	39,712
Coal, brown coal, coke, and peat.....	163,231	169,385	267,576	295,987
Tar, pitch, resin, and asphaltum.....	31,534	30,301	10,264	11,601
Clay goods.....	7,065	7,646	77,868	85,252
Oilcloth.....	863	876	2,655	3,037
Zinc and zinc goods.....	9,870	9,859	39,650	38,292
Tin and tinware.....	34,052	34,578	13,732	14,166

In the chemical industry, 1903 has witnessed an increased production, but the financial yield of the chemical works is decreasing, which is proved by the fact that the dividends of those among them which are share companies are following a downward tendency.

The importance of the German chemical industry is best characterised by the figures of its foreign trade; the import and export of its raw materials and the export of its produce have during the last 10 years risen by about 20 per cent., while the import of manufactured chemical articles has remained practically stationary:—

Raw Materials.

Year.	Imports.		Exports.	
	Quantity in 1,000 Tons.	Value in 1,000,000 Marks.	Quantity in 1,000 Tons.	Value in 1,000,000 Marks.
1902	1,998	212	765	44
1901	1,940	221	863	45
1900	1,928	218	727	45
1893	1,148	164	355	34

Manufactured Articles.

Year.	Imports.		Exports.	
	Quantity in 1,000 Tons.	Value in 1,000,000 Marks.	Quantity in 1,000 Tons.	Value in 1,000,000 Marks.
1902	318	111	810	346
1901	349	111	789	363
1900	322	118	750	352
1893	233	109	506	265

The number of establishments increased in 1902 from 7,352 to 7,539; the number of adult workmen has risen from 156,488 to 160,841, i.e., an increase of 2·78 per cent.; the sum of the wages earned has risen from 159,930,488 to 164,207,621 marks; the average annual wage amounted to 1,009 marks 67 pf., against 1,011 marks 10 pf. in the preceding year, so that after an uninterrupted rise during many years the average wage in the chemical industry shows for the first time a decrease.

AUSTRIA HUNGARY; CHEMICAL TRADE OF —.

Foreign Office Annual Series, No. 3199.

Chemical products to the value of 1,247,547*l.* were imported during 1903, this being 141,057*l.* more than in 1902, while "chemical auxiliaries" were exported to the value of 569,393*l.*, an increase of 83,814*l.* "Chemical products" stand at 1,039,308*l.*, an increase of 178,782*l.* In exports, dyeing and tanning materials total 703,306*l.*, india-rubber goods 461,186*l.*, and glass and glassware 2,152,962*l.* The following are imports from and exports to the United Kingdom:—

Imports.

Articles.	Quantity.	Value.
	Cwt.	£
Oils.....	38,423	45,795
Medicine and perfumery.....	1,119	10,734
Dyeing and tanning materials.....	10,850	14,362
Gums and resins.....	16,644	50,994
Mineral oil.....	1,875	635
Glass and glassware.....	4,118	3,798
Chemical substances.....	09,834	49,129
" products.....	14,211	57,785
Soap and candles.....	1,523	2,699

Exports.

Articles.	Quantity.	Value.
	Cwt.	£
Oils.....	53	90
Mineral water.....	37,924	28,011
Medicine and perfumery.....	61	686
Dyeing and tanning materials.....	201,085	141,627
Gums and resins.....	9,964	4,989
Mineral oil.....	39,985	9,450
India-rubber and india-rubber goods.....	13,190	39,335
Chemical substances.....	27,896	34,076
" products.....	90,782	131,677
Soap and candles.....	831	1,377

The following table shows what Austria-Hungary imported from British India:—

Articles.	Quantity.	Value.
	Cwt.	£
Rapo-seed	37,788	16,737
Castor oil.....	35,391	20,912
Oil seed.....	521,384	306,072
Linseed.....	254,213	144,840
Palm kernels.....	152,234	89,948
Sundries (seeds).....	1,108	846
Oils.....	1,713	2,109
Medicine and perfumery.....	146	2,003
Dyeing and tanning materials.....	88,237	77,989
Gums and resins.....	15,066	57,747
India-rubber.....	500	8,866
Chemical products.....	69	414

The exports to India included chemicals valued at about 28,000*l.* From the West Indies 200*l.* worth of perfumery was imported in 1903; Cape Colony took 1,264*l.* worth of chemical products, and Ceylon 1,133*l.* worth of medicines and perfumery.

X.—METALLURGY.

MURCHISON GOLDFIELD, WESTERN AUSTRALIA.

Bull. Imp. Inst. (Suppl. to Board of Trade J.), 1904, 2, 114.

The Murchison goldfield embraces the districts of Lennonville, Mount Magnet, and Boogardie. The auriferous deposits are of two types, white quartz reefs and laminated quartz and jasper veins, the whole being enclosed in a belt of altered rocks containing diorite, diabase pyroxenite, and shists, termed greenstone. The principal mines of the Mount Magnet district are seven in number, those of the Boogardie, 12, and Lennonville, 13. The total amount of ore worked from 1891 to 1902 was 191,820 tons, yielding 191,318 oz. of gold, or an average of 0.99 oz. per ton.

—A. S.

FERRO ALLOYS: U.S. CUSTOMS DECISION.

Ferrochrome, ferrotungsten, ferromolybdenum, and ferrovanadium, made in the same manner as ferromanganese, and used for the same purpose—to harden and toughen steel—were decided by the United States Circuit Court to be dutiable at 4 dols. per ton, by similitude to ferromanganese, under paragraph 122 of the present tariff. The contention of the Government that they were dutiable at 20 per cent. *ad valorem* under paragraph 183, as “metal unwrought,” was overruled. (Compare this J., 1903, 1072).—R. W. M.

GERMAN SILVER: U.S. CUSTOMS DECISION.

July 14, 1904.

German silver in bars and sheets was held to be dutiable at 45 per cent. *ad valorem* under paragraph 193 of the present tariff as a “manufacture of metal.” Paragraph 174 provides for “German silver unmanufactured” at 25 per cent. *ad valorem*. The Board held that its provisions cover only German silver in pigs or ingots, and not in any other form.—R. W. M.

XII.—FATS, FATTY OILS, Etc.

OIL AND SOAP TRADE OF MARSEILLES IN 1903.

Foreign Office Annual Series, No. 3230.

The Marseilles oil and oil-seed trade for the year 1903 was exceptionally good and the different companies and private mills realised handsome profits, having been favoured by a good market for oils in the early part of the year, which enabled crushers to make large sales for forward

monthly deliveries at full values; and, as there were record crops of sesame seed and earthnuts in India and on the west coast of Africa, prices of raw materials declined steadily and thus crushers covered their requirements at very profitable rates. For the 12 months the total imports of all oil seeds, earthnuts, and copra amounted to 485,544 tons, as against 422,880 tons for 1902, and 333,474 tons, the average of the five years 1898—1902. The leading figures in these imports for 1903 comprised 122,431 tons of gingelly seed from East India, as against the average of 66,789 tons; 86,291 tons of decorticated earthnut from India; 92,784 tons of undecorticated earthnut from the west coast of Africa; 27,681 tons of castor seed from East India (as against the average of 24,671 tons); and 106,678 tons of copra from all parts (as against the average of 86,185 tons). All these imports, with the exception of a few thousand tons of copra transhipped to Spain, have been crushed in Marseilles. By reason of the large increase in imports of oil seeds, the local mills have produced sufficient oils for edible and technical requirements; and imports of manufactured oils from other sources have continued on a very reduced scale, being chiefly confined to some edible cottonseed oil chiefly from the United States, for mixing purposes. These imports of cottonseed oil have amounted to 13,811 tons, as against 27,216 tons for 1902 and 45,988 tons for the five years average from 1898—1902. Two kinds of unrefined glycerin are produced at Marseilles, the one extracted before soap boiling and the other extracted from the soap lyes after the soap is made. The latter contains 80 per cent. of anhydrous glycerin, 10 to 10½ per cent. of salts, traces of sulphides, and small quantities ($\frac{1}{4}$ or even $\frac{1}{2}$ per cent.) of thiosulphates. The former is sold at 15 c. the litre, with a density of 1.240 and a maximum of $\frac{1}{2}$ per cent. of ash. The total production at Marseilles amounts to from 8,000 to 9,000 tons annually. There is a glycerin distillery at Marseilles which treats some 2,000 tons annually and turns out a white glycerin, doubly distilled, for current sale, as well as glycerin for the manufacture of dynamite. The rest of the output is exported in a raw condition to the United Kingdom, to Germany, and, especially, to the United States. Before the Transvaal war, Germany bought large quantities of glycerin for the manufacture of dynamite. Now, however, the business appears to have changed hands and to be done through the United Kingdom. The consumption of glycerin increases yearly, while the output has reached its maximum, which can only be increased by the development of the soap manufacture; the demand, therefore, will probably shortly exceed the supply. For some years past prices have ruled at about 100 fr. the ton in bulk for saponification glycerin, and 80 frs. for glycerin from the soap lyes. These prices are kept up fairly easily during the dull months, but are bound to go considerably higher when there is a big demand. All the linseed and practically all the sesame and poppy cakes are consumed for feeding cattle in France, or, in the case of black gingelly, for manuring. The earthnuts, which are brought to Marseilles undecorticated, are shelled there, and the shells ground into a whitish powder, which is used for cattle feeding, and is exported mainly to Hamburg and Stettin, where it is mixed with molasses and forms a good, brittle feed cake. Some goes to London, Liverpool, and Glasgow. The sales of soap effected have been much the same as those of 1902, and as the oils required have gone down in price, so has the price of soap. Thus no larger profits seem to have accrued to the boilers. An enormous stocks of the necessary oils are in hand, and there is no fear of their being exhausted, a good all-round year of business is expected. Exportation to the Far East and to Canada has slightly fallen. An increasing trade with Canada has been fully expected, but these expectations have not been realised. The old-fashioned mottled soap for which Marseilles was famous is gradually dying out, being replaced by the more convenient and harder white soap, mostly made with 20 to 25 per cent. of copra oil, and 35 to 40 per cent. of either earthnut oil or sesame oil, or cottonseed oil, as the price of the latter three vary. Earthnut oil and sesame, cottonseed oils, tallow and other compounds are now hardly used. The finest soaps made here, known as olive-oil soaps, are composed of varying mixtures of

earthnut and olive oil, probably never pure olive oil alone. When a pure olive-oil soap is absolutely required, a special vat is made up at about twice the price of ordinary soap.

BEESWAX FROM BRITISH CENTRAL AFRICA.

Bull. Imp. Inst. (Suppl. to Board of Trade J.), 1904, 2, 85-86.

A sample of the clarified beeswax was submitted to brokers, who reported that consignments of similar quality would meet with a ready sale in the London market, at prices ranging from 6*l.* 17*s.* 6*d.* to 7*l.* per cwt. They recommend that the wax be shipped in blocks of 90-100 lb. each, cased in "gunny." Beeswax is already exported from British Central Africa, but it is stated that much larger quantities could be readily produced.—A. S.

XIII. A.—PIGMENTS, PAINTS, Etc.

GREEN EARTH: U.S. CUSTOMS DECISION.

July 7, 1904.

Green earth was assessed for duty at 30 per cent. *ad valorem* as a "color," under paragraph 58 of the present tariff. An analysis of the sample showed it to be coarsely ground celadonite, a talc-like mineral. The Board of General Appraisers accordingly held it to be dutiable at 2 *dols.* per ton as a "wrought earth," under paragraph 98.—R. W. M.

XIV.—TANNING; LEATHER; GLUE, Etc.

TANNIN; EXPORT TRADE OF — IN INDIA.

Bd. of Trade J., July 28, 1904.

According to *Capital* (Calcutta), a recent official report mentions that investigations made in the Madras Presidency have resulted in testifying that the forests and waste lands of the Presidency possess a very large number of trees and shrubs which are capable of yielding tannin in sufficient quantities to be of practical importance. In the Northern Circle of the forest department, there are believed to be 70 different kinds of tannin-yielding shrubs and trees. That the supply is large throughout is evidenced by the fact that the Provincial Forest Department derives a revenue of over a lakh of rupees, from the sale of the right of collecting tannin-yielding materials. So far the only tannin materials exported from Southern India are myrabolams from Cocanada and the Vizagapatam coast ports, the exports varying from 6,000 to 7,000 tons per annum, of the value of about three lakhs of rupees. That there is no important export trade in Indian tannin is, according to the report, believed to be principally due to the fact that no serious and continuous efforts have ever been made to introduce Indian tannin material to the European markets.

XVI.—SUGAR, STARCH, Etc.

SUGAR: POLARISCOPIC TESTING OF —. U.S. CUSTOMS DECISION.

June 1, 1904.

The United States Circuit Court of Appeals rendered a decision on testing sugar by the polariscope, upholding the action of the Secretary of the Treasury in instituting a system of corrections for temperature not in general use among chemists. This decision reversed that of the lower court, in which it was held that "testing by the polariscope" had a well established trade meaning at the time of the passage of the Act of 1897. The higher court holds that as long as the Secretary acts in good faith and prescribes no regulations tending to make the prescribed test less accurate than it was at the time of the passage of the act, the courts should not interfere with the administrative details confided

to him. This decision affirms the correctness and authority of the system of corrections established mainly by H. W. Wiley. (See this J., 1903, 721.)—R. W. M.

XVII.—BREWING, WINES, SPIRITS, Etc.

SAKÉ: U.S. CUSTOMS DECISION.

May 25, 1904.

The United States Circuit Court held that saké, a beverage made from rice by processes similar to those employed in making beer, does not possess sufficient similarity to either wine or beer to be dutiable as either. The Court held it to be subject to a duty of 20 per cent. *ad valorem* under section 6 of the present tariff as a "manufactured article unenumerated," and reversed the decision of the Board of General Appraisers, holding it to be dutiable by similitude as a "still wine" under paragraph 296.—R. W. M.

XX.—FINE CHEMICALS, Etc.

SACCHARIN; IMPORTATION OF — INTO GREECE PROHIBITED.

Bd. of Trade J., July 21, 1904.

By a law of the 28th April/11th May last, the importation into Greece or the employment in that country of saccharin or other artificial sweetening substances possessing a higher sweetening power than cane sugar, without its nutritive qualities, is prohibited except for pharmaceutical purposes.

A subsequent decree specifies "dulcine" "sucrase" and "sucramine" or "*sucré de Lyon*," as being the sweetening substances other than saccharin, the importation of which is prohibited under the law. It provides, however, that the prohibited substances may be imported by chemists or pharmacists exceptionally, on special permission of the Minister of Finance, but only through Custom Houses of the 1st or 2nd class, and in quantities not exceeding 50 *dramas* (3,000 grains) a year. This applies equally in the case of saccharin, &c., desired to be introduced by Parcel Post. Importations of saccharin, &c., as "samples without value" are not permitted.

GARDENIA; OIL OF —. U.S. CUSTOMS DECISION.

July 1, 1904.

Oil of gardenia, assessed for duty as "alcoholic perfumery" at 60 c. per lb. and 45 per cent. *ad valorem*, under paragraph 2 of the present tariff, was decided to be dutiable at 25 per cent. *ad valorem*, under paragraph 3 as a "chemical compound." (Compare this J., 1904, 345.)—R. W. M.

ROSE; ARTIFICIAL OIL OF —.

U.S. CUSTOMS DECISION.

June 29, 1904.

Synthetic oil of rose, made to resemble the natural oil as closely as possible, and showing substantially the properties of the natural oil, was decided to be free of duty as "otto of roses" under paragraph 626 of the present tariff. Assessment of duty at 25 per cent. *ad valorem* as a "chemical compound" under paragraph 3 was overruled.—R. W. M.

Patent List.

N.B.—In these lists, [A.] means "Application for Patent," and [C.S.] "Complete Specification Accepted."

Where a Complete Specification accompanies an Application, an asterisk is affixed. The dates given are (i) in the case of Applications for Patents, the dates of application, and (ii) in the case of Complete Specifications Accepted, those of the Official Journals in which acceptances of the Complete Specifications are advertised.

Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, AND MACHINERY.

- [A.] 15,923. Rhodes. Valves for controlling acids and other chemical fluids and vapours. July 18.
- " 16,024. Leyer. Driers.* July 19.
- " 16,045. Walton. Coal and ore washing machinery. July 20.
- " 16,261. Brit. Thomson Houston Co. (Gen. Electric Co.). Apparatus for electrically heating liquids. July 22.
- " 16,316. Hantke. Process and appliance for raising liquids by means of compressed air.* July 23.
- " 16,354. Shields. Means for removing dust from gases.* July 23.
- " 16,427. Browne and McKinlay. Apparatus for subjecting gases or vapours to the action of liquids or vapours therefrom, especially applicable to scrubbing or enriching illuminating or other gases, or for recovery purposes. July 25.
- " 16,588. Matcham. Combined rotary kilns and driers. [U.S. Appl., Jan. 11, 1904.]* July 27.
- " 16,618. Robinson. Furnaces. July 28.
- " 16,652. Challis. Filters, filtering media, &c. July 28.
- " 16,826. Roche. Filtering apparatus. July 30.
- [C.S.] 18,346 (1903). Michael and Roberts. Grinding machines. Aug. 4.
- " 19,320 (1903). Macfarlane and Macfarlane. Centrifugal machines. July 27.
- " 20,163 (1903). Bloxam (Dillon). Treatment of liquids with ozonised air or other gaseous ozone mixtures. July 27.
- " 1013 (1904). Kauffmann. Working and construction of furnaces for roasting ores and like materials. July 27.
- " 3003 (1904). Stade. Process and devices for filtering liquids. Aug. 4.
- " 12,164 (1904). Dahl. Centrifugal separators. Aug. 4.
- " 14,484 (1904). Wheelwright and Fiske. Apparatus for removing liquids from solids, applicable for the treatment of garbage and other purposes. Aug. 4.

II.—FUEL, GAS, AND LIGHT.

- [A.] 15,908. Reichwald (F. Krupp, Act.-Ges.). Process of and apparatus for producing combustible gases from bituminous fuels. July 18.
- " 15,937. Boaler. Incandescent mantles. July 15.
- " 16,008. Koppers. Coke ovens.* July 19.

- [A.] 16,067. Grice. Gas producers.* July 20.
- " 16,069. Smith. Manufacture of producer gas, applicable both to pressure and suction plants. July 20.
- " 16,113. Calvert and Snape. Method of treating incandescent lamp filaments to increase their density and also the density of the carbon deposited on them during the flashing process. July 20.
- " 16,288. Akt.-Ges. f. Selas Beleucht. Apparatus for the production of mixtures of gas and air. [German Appl., Oct. 21, 1903.]* July 22.
- " 16,425. Electric Equipment and Securities, Ltd., and Ruzicka. Manufacture of electric incandescence bodies. July 25.
- " 16,427. Browne and McKinlay. See under I.
- " 16,593. Hemingway and Booth. Apparatus for washing and purifying gas. July 27.
- " 16,658. Bateman. Mantles for incandescent gas lighting. July 28.
- " 16,763. Boutillier. Apparatus for producing poor gas free from tarry matters. [Fr. Appl., Aug. 25, 1903.]* July 29.
- " 16,765. Kirkham, Hullett, and Chandler, Ltd., and Hersey. Apparatus for washing or scrubbing gas. July 29.
- " 16,756. Colson. Manufacture and purification of illuminating gas. July 29.
- [C.S.] 17,788 (1903). Lake (Selas Ges.). Apparatus for the production of mixtures of gas and air. Aug. 4.
- " 20,678 (1903). Cerasoli. Gas producers. July 27.
- " 21,964 (1903). Derval. Inclined gas retorts. Aug. 4.
- " 2547 (1904). Capitaine. Suction gas producers. Aug. 4.
- " 8993 (1904). Poetter. Gas-producing plant for heating retort furnaces. Aug. 4.
- " 12,861 (1904). Tobiansky. Refuse-consuming and gas-producing furnaces. Aug. 4.
- " 14,323 (1904). Poetter. Gas producers. Aug. 4.
- " 14,465 (1904). Klein. Gas-purifying plant. Aug. 4.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM, AND MINERAL WAXES.

- [A.] 16,543. Hanmer. Apparatus for treating peat, turf, wood, &c., to obtain valuable products therefrom. July 27.
- " 16,756. Lyndall and Costley-White. Process for rendering benzene or the like non-inflammable. July 29.
- [C.S.] 24,801 (1903). Tabourin, Girard, and Portevin. Manufacture of solid and fluid mineral lubricants. July 27.
- " 12,122 (1904). Weyl. Distillation of coal tar. Aug. 4.

IV.—COLOURING MATTERS AND DYESTUFFS.

- [A.] 15,920. Ransford (Cassella and Co.). Manufacture of sulphide colours. July 18.

- [A.] 15,935. Abel (Act.-Ges. f. Anilinfabr.). Manufacture of indophenols. July 18.
- " 15,982. Shillito (Aniline Colour and Extract Works, formerly J. R. Geigy). Manufacture of nitro-o-oxyazo colouring matters. July 19.
- " 16,119. Johnson (Kalle and Co.). Manufacture of new dyes. July 20.
- " 16,120. Johnson (Kalle and Co.). Manufacture of new dyes. July 20.
- " 16,121. Johnson (Kalle and Co.). Manufacture of new dyes. July 20.
- " 16,268. Abel (Act.-Ges. f. Anilinfabr.). Manufacture of sulphur dyes and of materials for their production. July 22.
- " 16,269. Imray (Meister, Lucius und Brüning). Manufacture of violet sulphurised dyestuffs. July 22.
- " 16,538. Johnson (Badische Anilin und Soda Fabrik). Manufacture of violet blue colouring matters of the anthracene series and intermediate products of the said manufacture. July 26.
- " 16,566. Shillito (Aniline Colour and Extract Works, formerly J. R. Geigy). Manufacture of o-oxyazo colouring matters from 2-diazo-1-naphthol sulphonic acids. July 27.
- [C.S.] 21,800 (1903). Imray (Meister, Lucius und Brüning). Manufacture of yellow, orange-yellow to orange sulphurised dyestuffs. Aug. 4.
- " 21,945 (1903). Imray (Meister, Lucius und Brüning). Manufacture of clear yellow, orange-yellow to yellow-orange sulphurised dyestuffs. July 27.
- " 12,270 (1904). Lake (Oehler). Sulphur dyes. Aug. 4.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

- [A.] 15,906. Hadden. Printed fabrics. July 18.
- " 15,943. Johnson (Badische Anilin und Soda Fabrik). Production of coloured discharges on dyed materials. July 18.
- " 15,944. Johnson (Badische Anilin und Soda Fabrik). The discharging of dyed textile fabrics. July 18.
- " 15,978. Bauersachs and Brückner. Processes of dyeing cops.* July 19.
- " 16,105. Möller-Holtkamp. Dressing or sizing yarns. July 20.
- " 16,185. Bartelt. *See under VII.*
- " 16,313. Boulton (Poisson). Method of retting and washing vegetable textile fibres. July 23.
- " 16,351. Soc. Anon. des Rizières Françaises. Treatment of rice flour with a view to its substitution for various starches used in sizing and finishing. [Fr. Appl., Aug. 1, 1903.]* July 23.
- " 16,503. Wild. The dyeing of textile fibres or fabrics. July 26.
- " 16,594. Hulse and Co., Ltd., and Shaw. The production of printed fabric, such as calico. July 27.
- [C.S.] 19,002 (1903). Armengol. Thread, and process of manufacturing the same. July 27.
- " 20,476 (1903). Mascelli. Apparatus for dyeing and similar purposes. July 27.

- [C.S.] 20,925 (1903). Thompson (Wegmann and Co.). Method of dyeing cotton and the like, and apparatus therefor. Aug. 4.

VII.—ACIDS, ALKALIS, AND SALTS.

- [A.] 16,185. Bartelt. Apparatus for preparing bleaching liquor. July 21.
- " 16,353. Shields. Treatment of the gases issuing from pyrites burners.* July 23.
- " 16,504. Woltereck. Production of ammonia. July 26.
- " 16,672. Smith. Manufacture of monoxide of lead. July 28.
- [C.S.] 5101 (1904). Bloxam (Gibbs). Manufacture of salts of oxyacids of chlorine and salts of chromic acid. July 27.

VIII.—GLASS, POTTERY, AND ENAMELS.

- [A.] 16,279. Nolan. Process of and apparatus for fire-polishing glass. July 22.
- [C.S.] 16,847 (1903). Martin. Means of decorating pottery, porcelain, glass, paper, or other medium. July 27.
- " 12,201 (1904). Fidler. *See under IX.*

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

- [A.] 15,979. Schmidtgen and König. Process for manufacturing an isolating material. July 19.
- " 16,002. Mill. Bricks. July 19.
- " 16,029. Gesner. Incombustible material and the method of its production. July 19.
- [C.S.] 20,421 (1903). Howett. Manufacture of artificial stone. July 27.
- " 22,769 (1903). Perpignani and Candlot. Kilns for burning cement, lime, &c. Aug. 4.
- " 9944 (1904). Ducastel. Agglutinant or cement, and method of manufacturing the same. July 27.
- " 12,201 (1904). Fidler. Continuous kilns for burning blue and salt-glazed and vitrified bricks, tiles, and terra-cotta, &c. Aug. 4.
- " 14,374 (1904). Henry. Continuous kilns for burning fireproofing, tile, and other clay products. Aug. 4.

X.—METALLURGY.

- [A.] 15,964. Slater. Method for the extraction and reduction of precious metals from ores, earths, sands, and tailings. July 19.
- " 16,028. Johnson (Mcya). Manufacture of steel. July 19.
- " 16,112. Ogle and Woolford. Furnaces for the treatment of refractory ores. July 20.
- " 16,205. Edelmunn and Wallin. *See under XI.*
- " 16,267. Gauntlett. *See under XI.*
- " 16,276. Kaufmann and Bouvier. Manufacture of steel. July 22.
- " 16,396. Abel (Siemens und Halske Act.-Ges.). *See under XI.*
- " 16,412. Lake (Cyanid-Ges.). Treatment of iron and steel for the hardening or case-hardening of the same. July 25.

- [A.] 16,419. Engels. Process for treating steel and armour plates. [Fr. Appl., March 21, 1904.]* July 25.
- " 16,448. Harmet. Process for refining cast iron, and apparatus therefor. [Fr. Appl., Aug. 28, 1903.]* July 25.
- " 16,449. Fink and Huguenot. Process and apparatus for granulating or pulverising certain fusible metals and alloys. [Fr. Appl., Jan. 7, 1904.]* July 25.
- " 16,491. Swinburne. Treatment of sulphide ores. July 26.
- " 16,492. Swinburne. Treatment of antimony, arsenic, bismuth, and gold ores. July 26.
- " 16,517. Broadbent and Herdman. The galvanisation of metal and the manufacture of metallic alloys. July 26.
- " 16,754. Tyara. Apparatus for treating and amalgamating metals. July 29.
- [C.S.] 1018 (1904). Kauffmann. *See under I.*
- " 1941 (1904). Wilkins. Cement for iron and steel castings and the like. Aug. 4.
- " 4975 (1904). Moore and Heskett. Process of and apparatus for treating ferruginous ore for the manufacture of iron and steel therefrom. Aug. 4.
- " 12,976 (1904). Cutler. Furnace for calcining quicksilver ores. July 27.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

- [A.] 15,352. Berg. Electrode for electrical accumulators. [Appl. in Sweden, July 18, 1903.]* July 18.
- " 16,205. Edelmann and Wallin. Electric furnaces and the extraction of zinc by means of the same. July 21.
- " 16,267. Gauntlett. Deposition of zinc and other metals by means of electricity. July 22.
- " 16,396. Abel (Siemens und Halske Act.-Ges.). Method of producing zinc from sulphate solutions by electrolysis.* July 25.

XII.—FATTY OILS, FATS, WAXES, AND SOAP.

- [C.S.] 16,825 (1903). Westaway. Method of and apparatus for granulating and solidifying fat or the like. Aug. 4.
- " 18,451 (1904). Zimmermann and Stöhr. Floating soap, and process for the manufacture of the same. Aug. 4.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(B).—RESINS, VARNISHES.

- [A.] 16,800. Bucklin. Lac derivatives and their application and process of production.* July 30.

XIV.—TANNING, LEATHER, GLUE, SIZE, Etc.

- [A.] 16,275. Allaire. Tanning hides and skins. July 22.
- [C.S.] 20,063 (1903). Horn. Process for preparing a clear solution of casein. July 27.

XVI.—SUGAR, STARCH, GUM, Etc.

- [A.] 15,984. Stiepel. *See under XX.*
- " 16,262. Börner. Manufacture of starch and sugar.* July 22.
- " 16,546. Stein and Loewenthal. Manufacture of sugar. July 27.

XVII.—BREWING, WINES, SPIRITS, Etc.

- [C.S.] 17,975 (1903). Sleeman. Treatment of grain for the production of malt. July 27.
- " 14,517 (1904). Schreier. Malting drum. Aug. 4.

XVIII.—FOODS; SANITATION, WATER PURIFICATION; & DISINFECTANTS.

(A).—FOODS.

- [A.] 16,189. Barbier. Method of converting whey into vinegar.* July 21.
- " 16,351. Soc. Anon. des Rizières Françaises. *See under V.*
- [C.S.] 20,630 (1903). Roewer. Butyrometers. Aug. 4.
- " 18,689 (1904). Fölsing. Preservative for food. July 27.

(B).—SANITATION; WATER PURIFICATION.

- [A.] 16,689. Tuckfield and Garland. Regenerative apparatus for water purification and the like. July 29.
- [C.S.] 19,916 (1903). Woodall. Water-purifying apparatus. July 27.
- " 12,361 (1904). Tobiansky. *See under II.*
- " 14,482 (1904). Wheelwright and Fiske. Apparatus for cooking garbage and removing the oil therefrom. Aug. 4.
- " 14,483 (1904). Wheelwright and Fiske. Apparatus for cooking garbage and removing the oil therefrom. Aug. 4.

(C).—DISINFECTANTS.

- [C.S.] 14,372 (1904). Marot. Process and apparatus for producing a gaseous germicide and insecticide. Aug. 4.

XIX.—PAPER, PASTEBOARD, Etc.

- [A.] 16,281. Werle. Grinding wood for the manufacture of paper. [German Appl., Nov. 29, 1903.]* July 22.
- " 16,403. Nebrich. Pulp strainers for paper manufacture.* July 25.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

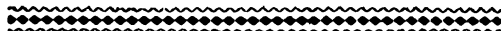
- [A.] 15,980. Liebreich. Preparations for the production of chloroform. July 18.
- " 15,984. Stiepel. Manufacture of betaine and its salts from the molasses and waste products of beetroot-sugar manufacture. July 18.
- " 16,602. Kalle and Co. Manufacture of bromine alkyl acetamides. [German Appl., Dec. 9, 1903.]* July 27.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

- [A.] 16,177. Edwards. Photographic films. July 21.
[C.S.] 20,325 (1903). Zimmermann (Chem. Fabr. auf Actien, vorm. E. Schering). Photographic paper. July 27.
" 20,434 (1903). Hill and Young. Direct reproduction of drawings by photography. Aug. 4.

XXII.—EXPLOSIVES, MATCHES, Etc.

- [C.S.] 17,415 (1903). Bell. Method of and apparatus for forming blocks of guncotton. Aug. 4.
" 17,893 (1903). Bell. Pressing of guncotton blocks, and apparatus therefor. July 27.
" 18,562 (1904). Möller. Manufacture of nitro-glycerin. Aug. 4.



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ANNUAL GENERAL MEETING, NEW YORK, 1904.

The Annual General Meeting will be held in New York City on Thursday, Sept. 8th, and following days. Members who propose to attend the meeting are requested to inform the General Secretary, as soon as possible, by what steamer they will travel. The principal boats will be met on arrival at New York by a representative of the Reception Committee, who will escort the guests to the Hotel Seville, Madison Avenue and 29th Street, which will be the Society's Headquarters in New York. A similar system will be observed at all the other cities visited by the special train. A revised programme appeared in the July 30th issue.

In accordance with the provisions of Rule 18 of the Bye-laws, notice is hereby given that those members whose names are printed in *italics* in the list of Council will retire from their respective offices at the forthcoming Annual Meeting.

Mr. Wm. H. Nichols has been nominated to the office of President under Rule 8; Dr. Edw. Divers, Prof. W. R. Eaton Hodgkinson, Mr. Max Muspratt, and Mr. T. J. Parker have been nominated Vice-Presidents under Rule 8; and Sir Wm. Ramsay has been nominated a Vice-President under Rule 11.

Mr. Oscar Guttman, Prof. W. R. Lang, Dr. Boverton Redwood, and Mr. Walter F. Reid, have been nominated under Rule 18 to fill four vacancies among the Ordinary Members of Council. No ballot will be required.

The Hon. Treasurer and Hon. Foreign Secretary have been nominated for re-election to their respective offices.

Changes of Address.

When notifying new addresses, members are requested to write them distinctly, and state whether they are temporary or permanent. Multiplication of addresses is also to be avoided as tending to create confusion. When sending subscriptions, the use of the form attached to the application helps in the verification of addresses, on which the safe delivery of the Journal depends.

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PATENT SPECIFICATIONS may be obtained by post by remitting as follows:—

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United States.—1s. each, to the Secretary of the Society.

French.—1 fr. 25 c. each, to Balin et Cie., 55, Rue des Franco-Bourgeois, Paris (3°).

I.—PLANT, APPARATUS AND MACHINERY.

ENGLISH PATENTS.

Discharging or Filling Vats and like Receptacles; Apparatus for —. W. P. Thompson, London. From H. W. Blaisdell, Los Angeles, Cal., U.S.A. Eng. Pat. 22,094, Oct. 13, 1903.

ON a suitable support is arranged a central column, carrying rotating arms at its base. From the arms depend cup-shaped discs or plates for feeding the material to the centre of the vat. In the central column is an elevator for lifting the material and discharging it into a shoot. The whole apparatus can be raised or lowered, can be modified so as to be used for charging as well as discharging, and can be moved over a series of vats.—W. H. C.

Distributing Apparatus especially applicable for use in Filling Vats or the like. W. P. Thompson, London. From H. W. Blaisdell, Los Angeles, Cal., U.S.A. Eng. Pat. 22,095, Oct. 13, 1903.

A DISTRIBUTOR consisting of curved spiral blades is mounted on a vertical shaft passing through a hopper arranged over a vat. Means are provided for rotating the shaft, thereby causing the material fed into the hopper to be evenly distributed. The distributor can be raised or lowered by suitable means, and a guard ring is provided to prevent the material from being thrown over the edge of the vat. The apparatus may be fixed, or movable over a series of vats.—W. H. C.

Centrifugal Extraction Apparatus. R. W. Strehlenert, Neu Babelsberg, Germany. Eng. Pat. 26,471, Dec. 3, 1903.

THE apparatus consists of a centrifugal basket provided at its outer wall with a number of holes, and furnished at its centre with a truncated cone. Inside this conical aperture is placed a conical flange forming part of the casing surrounding the centrifugal basket, and through this passes the rotating shaft carrying the basket. Upon the casing rest two covers, one being fitted tightly to the edge of the casing by an indiarubber ring, whilst the other is suspended below, an annular space being thus formed between the two covers. The centrifugal force causes the extracting liquid to rise at the edge of the casing and to overflow into the annular space above, where the friction of the walls destroys the centrifugal velocity and allows the liquid to flow back into the basket through a central opening provided in the covers.—L. F. G.

Varnishing, Pitching, or similarly Treating Casks, Vats, or the like; Apparatus for —. M. D. Kramer, Laeken-Brussels. Eng. Pat. 12,647, June 3, 1904.

THE improvements which relate to the apparatus described in Eng. Pat. 25,362 of 1902, consist in placing a shallow bath over the pitch-melter. In this bath are several radially disposed rollers to facilitate the manipulation of the cask, whilst the bath itself serves to collect and return to the melter any excess of pitch, &c. The injector pipe can be raised or lowered by a lever.—W. H. C.

Desiccation [Evaporation] of Liquids. W. D. Neel, Chicago. Eng. Pat. 13,186, June 10, 1904.

TO obtain the solid constituents of a liquid in the form of a powder, the liquid is sprayed into a closed chamber where the spray is subjected to the action of a "heated innocuous gas," such, e.g., as air. The liquid is carried off in a state of vapour, and the solid falls to the bottom as a powder. The sides and top of the chamber are formed of pervious material, and the chamber itself is enclosed in an outer casing. The pressure in the space between the two is reduced by suitable means so that the vapour-laden gas passes outwards through the pervious material. Means are provided for spraying the liquid, for continuously removing the powder, and for introducing and exhausting the heated gas.—W. H. C.

UNITED STATES PATENTS.

Funnel. W. E. Burgess, Aberbeeg, England. U.S. Pat. 764,422, July 5, 1904.

THE combination is claimed, with a funnel for filling vessels with liquid, of a siphon of which one limb is adapted to dip into the vessel to be filled, and an upright transparent pipe, which connects the lower end of the other limb of the siphon with the exit-opening of the funnel.—W. H. C.

Dryer. J. D. Bourdeau, Assignor to Bourdeau Food Co., Battlecreek, Mich., U.S.A. U.S. Pat. 764,552, July 12, 1904.

A SERIES of vertically superposed, horizontal, parallel conduits, with perforated bottoms, have conveyor worms working in opposite directions in alternate conduits. They are connected at alternate ends, the material to be dried is fed into the top conduit and passes through each in succession to the outlet at the bottom. Means are provided for working the conveyors and for withdrawing the air from each conduit.—W. H. C.

Muffle. J. C. Fox, Assignor to the Morgan Crucible Co., Ltd., London. U.S. Pat. 765,728, July 26, 1904.

THE muffle consists of a horizontal chamber, with a movable front wall, and its further end is provided with a discharge aperture for gases. Air passages extend longitudinally along the sides within the muffle, which has air-inlet apertures at intervals throughout its length, to supply oxygen uniformly to the contents. The apertures to the air passages are designed to receive plugs for controlling the admission of air.—E. S.

FRENCH PATENTS.

Drying Machines [Centrifugal] with Several Chambers. G. ter Meer. Fr. Pat. 341,131, Jan. 26, 1904.

SEE Eng. Pat. 1505 of 1904; this J., 1904, 537.—T. F. B.

Evaporating in Vacuo; Columns for —. T. Suzuki. Fr. Pat. 341,356, Feb. 9, 1904.

SEE Eng. Pat. 3165 of 1904; this J., 1904, 483.—T. F. B.

Filter-Presses. P. Meura. Fr. Pat. 340,503, Feb. 13, 1904.

THE supply-channel is placed at the side of each plate, slightly above the top. The connecting passage, to the interior of the chamber, has the same sectional area as the supply channel, in order to obviate any obstruction.

—W. H. C.

Filter-Press. Soc. Française de la Viscose. Fr. Pat. 340,871, March 1, 1904.

THE filter-press, which is for vacuum filtration, has the joints between the plates made by rubber rings let into grooves. The supply, delivery and washing channels are situated at the corners of the plates.—W. H. C.

Refining or Purifying Apparatus. C. W. Stanton. Fr. Pat. 340,620, Feb. 22, 1904.

SEE Eng. Pat. 5791 of March 9, 1904; this J., 1904, 538. —W. H. C.

Measuring Apparatus for Granulated or Powdered Materials. J. W. Pope, U.S.A. Fr. Pat. 340,638, Feb. 22, 1904.

TWO discs are mounted on an axis in such a manner that the vertical distance between them can be regulated by a screw. The upper disc can be rotated and has several apertures, whilst the lower one is fixed and has but one opening connected with a delivery spout. Between the discs are a number of telescopic tubes forming measures and fitting into the holes in the upper disc. Above the upper disc is a feed-tube, connected with a hopper, containing the material to be measured. As the upper disc is rotated, the measuring tubes are first brought under the feed and filled, and then later, opposite the discharge, and emptied.—W. H. C.

Distilling; Apparatus for —. O. Perrier. Fr. Pat. 340,700, Feb. 25, 1904.

IMPROVED analysers and temperature and pressure regulators are applied to continuous or discontinuous distillation columns.—W. H. C.

Muffles. The Morgan Crucible Co., Ltd. Fr. Pat. 341,045, March 8, 1904.

SEE U.S. Pat. 765,728 of 1904; preceding these.—T. F. B.

Separating Apparatus; Centrifugal —. E. Seger. Fr. Pat. 341,083, March 9, 1904.

SEE Eng. Pat. 458 of 1904; this J., 1904, 368.—T. F. B.

II.—FUEL, GAS, AND LIGHT.

Sulphur; Forms in which — occurs in Coal, their Calorific Values and their Effects upon the Accuracy of the Heating Powers, calculated by Dulong's Formula. E. E. Somermeier. J. Amer. Chem. Soc., 1904, 26, 764—780. (See this J., 1904, 601.)

CONTINUING his experiments, the author finds that when the sulphur is present in the form of ferrous sulphate, the results given by Dulong's formula will be 10 cal. too low for each 1 per cent. present in that form. In the case of sulphur as pyrites, the results based on uncorrected ultimate analyses are about 9.6 cal. too high for each 1 per cent. of sulphur in that form, whilst if corrections be made for the amount of oxygen in the ash, the calculated results will be 6.6 cal. too low. When the sulphur is present in organic combination, the results given by the formula are probably 4.5 cal. too low for each 1 per cent. of such sulphur. From the average results obtained with five samples of coal, the general conclusion arrived at is that very satisfactory results for total sulphur are given by Dulong's formula (unmodified) applied to the figures of an uncorrected ultimate analysis. The formula gives lower results than those obtained by the use of Mahler's calorimeter, especially in the case of samples highest in moisture and oxygen, e.g., Waterloo coal. By substituting Berthelot's value for amorphous carbon (8140) the formula gave

results in close agreement with the calorimetric determinations, except in the case of the Waterloo coal, the average results with which were still 1 per cent. too low. The values obtained with this modified formula applied to certain samples of Ohio coals, agreed closely with values actually determined.—C. A. M.

ENGLISH PATENTS.

Fuel [Briquettes]; Artificial —. C. Cory, Swansea. Eng. Pat. 14,014, June 23, 1903.

BRIQUETTES of the kind described in Eng. Pat. 4830 of 1901 (this J., 1902, 459) are rendered more waterproof by adding a small quantity (about 4 per cent.) of pitch or other similar hydrocarbon to the mixture of pulverised fuel and agglutinant material, before forming it into briquettes.—H. B.

Solidifying Petroleum and other Mineral Oils for their Application as Fuel and for Lighting Purposes; Process for —. V. J. Kuess. Eng. Pat. 7481, March 29, 1904. III., page 817.

Peat [Briquettes]; Treatment of —. A. McLean, London, and W. Paterson, Dumfries. Eng. Pat. 12,231, May 30, 1904.

UNSLAKED lime, in amount about 5 per cent. of the quantity of peat treated, is sifted over the latter, and the mass thoroughly mixed. After drying on a "hearth," the mass is formed into briquettes under a pressure of about 2 tons per square inch.—L. F. G.

Sewage [Sludge]; Treatment of — [Fuel Briquettes]. A. McLean and W. Paterson. Eng. Pat. 12,282, May 30, 1904. XVIII. B., page 838.

Furnaces for Burning Liquid Hydrocarbons. W. P. Thompson. From W. N. Best, Los Angeles, Cal., U.S.A. Eng. Pat. 23,659, Oct. 31, 1903.

THE furnace is built of specially constructed fire-bricks, and comprises a fire-box open below, and situated above an air chest from which air is supplied to the furnace at suitable points, an arch of fire-brick slanting upwards and furnished with a refractory shield against which the atomised fuel is blown, a passage in the arch to pre-heat the air supplied to the furnace and prevent burning of the arch material, and means for controlling the air supply. —L. F. G.

Furnaces and Fire Boxes for burning Liquid Hydrocarbons. W. P. Thompson. From W. N. Best, Los Angeles, Cal., U.S.A. Eng. Pat. 23,660, Oct. 31, 1903.

THE invention relates to an improved form of burner having an oil outlet, and a steam or air nozzle arranged behind in such a way as to discharge across the oil outlet. The nozzle is reduced in area at the middle, and "flares" outwardly at the sides, so that the oil is carried by the steam or air in a fan-shaped blaze that completely fills the furnace. A plate is arranged over the outlet to regulate the supply of fuel. —L. F. G.

Vaporising and Burning Oils; Apparatus for —. F. Dumontier, C. Chartier (née Paysant), L. H. Ninin, and M. Vénitien (née Leroy), Paris. Eng. Pat. 8596, April 14, 1904.

THE apparatus, designed for use with heavy oils, and of which two forms are described, consists of one or more vertical vaporising chambers heated by the flame of the burner itself; a collecting chamber at the top, leading the vapours to the burner; and recesses formed in the vaporising chambers for collecting any deposits which may be produced; all portions of the apparatus being so arranged as to be easily taken to pieces for purposes of cleaning.—H. B.

Oxy-hydrogen Combustion Apparatus. The International Oxy-generator Syndicate, Ltd., and A. Rosenberg, London. Eng. Pat. 14,663, July 1, 1903.

A HEAVY hydrocarbon is forced from a reservoir through a tube containing a wick, or through capillary tubes, into a volatilising chamber packed with asbestos or wire gauze, and heated by a burner. The vapour passes into a mixing

chamber, provided with suitable baffle plates, where it is mixed with oxygen under pressure, and then issues to the burner jet. A by-pass from the oxygen supply-pipe leads to the reservoir, supplying the pressure requisite for forcing out the hydrocarbon, the rate of supply being therefore always proportional to the pressure of the oxygen, and to the consumption. The pressure in the reservoir may be augmented by heating.—L. F. G.

Siemens Regenerative Furnaces; Impts. in —. A. Kurzwehnart, Zuckmantel, Austria. Eng. Pat. 8311, April 11, 1904.

THE combustible gas remaining in the regenerative chamber of the Siemens furnace is forced, before the reversal of the gas and air current, into the furnace by means of waste gases drawn, for example, from the flue of the furnace itself. Suitable valves are provided for simultaneously shutting off the supply of producer gas, and admitting the supply of waste gases which is to drive the former into the furnace. The waste gases may be drawn from the flue and driven through the regenerative chamber by means of a fan, steam injector, or the like. Alternatively, the waste gases may be driven through the chamber by means of a current of air introduced at a suitable point behind them; in this case the air is introduced into a branch of the furnace flue, which is normally filled with waste gases, the branch being placed in communication with the gas-supply pipe at the time of reversal.—H. B.

Gas Producers [for Moist or Bituminous Fuels].

A. Cerasoli, London. Eng. Pat. 20,678, Sept. 25, 1903.

THE upper region of the producer is divided into three compartments by two partitions depending from the top to different depths. Two of the compartments have feeding hoppers at the top, the gas-outlet pipe being arranged on the top of the third. An inclined grate, to which the blast of air, or air and steam, is supplied, is placed at the foot of the producer at the side opposite to that of the gas-outlet compartment; hence the main volume of gas produced in the zone of combustion is led off directly by this compartment. By means of a steam injector directed through an opening in the upper part of the partition between the other two compartments, part of the hot gas from the combustion zone is drawn up through the one column of raw fuel and driven down through the other; hence the moisture or tarry matter contained in the fuel (peat, soft slack, &c.) is distilled off and driven through the incandescent zone before reaching the outlet.—H. B.

Sealing Metal into Glass or other Vitreous Material [Wires for Incandescent Lamps, &c.]; Methods of —. E. A. Carolan, London. From The General Electric Co., of Schenectady, New York, U.S.A. Eng. Pat. 18,255, Aug. 24, 1903.

THE metal is surrounded with a glass envelope, and heated electrically, and any gases driven off by the heating are removed from the envelope by a pump. While still hot, the glass is fused round the metal.—W. C. H.

Incandescent Mantles [Wood Cellulose]. Evered and Co., Ltd., Smethwick. From C. Weiblen, Metzingen, Germany. Eng. Pat. 22,451, Oct. 17, 1903.

"WOOD cellulose, prepared in the ordinary way, is made suitable for weaving or knitting by drawing the threads or filaments of the same through preferably a fatty, saponaceous, watery liquid, such as soapy pulp containing fat and water." The prepared threads are woven into mantle fabrics, cleansed in an acid bath, washed with distilled water, and then impregnated as usual with salts of suitable earths. Fabrics of wood cellulose are stated to have a greater absorbing power than those of cotton.—H. B.

UNITED STATES PATENTS.

Superheater for Gas Producers. A. B. Duff, Pittsburg. U.S. Pat. 764,437, July 5, 1904.

THE superheater comprises a cylindrical casing; upper and lower tube-plates; two up-comer tubes and two down-comer tubes extending between the tube-plates; a dust-box at the foot of each set of tubes; and an inlet and an outlet

on the casing to cause the air, or air and steam, required for the producer to circulate round the tubes; the cross-sectional area of the tubes being much greater than that of the gas-supply pipe from the producer, so as to reduce the speed of the gas and permit the deposition of dust.—H. B.

Combustible Gas from Petroleum-Oil or other Hydrocarbon Fluids; Apparatus for Producing —. C. A. Kuenzel, Brooklyn, N.Y. U.S. Pat. 764,601, July 12, 1904.

A COMBUSTION-CHAMBER, steam-chamber, and hydrocarbon-chamber are so combined that the heated air and hydrocarbon vapour are passed through a mixing vessel, having a perforated diaphragm, to the combustion-chamber.

—W. H. C.

Gas Washer. O. N. Guldin, Fort Wayne, Ind.

U.S. Pat. 763,049, July 5, 1904.

THE gas ascends through small perforations in a horizontal plate on to which the washing liquid is supplied from above. Adjacent to the perforations are small projecting plates which deflect the ascending streams of gas along the direction of the plate and accelerate the flow of the liquid on the plate.—T. F. B.

Smelting Compounds and Producing Carbides [Electrically]. W. S. Horry, Assignor to Union Carbide Co. U.S. Pat. 765,838, July 26, 1904. XI. A., page 828.

Fuel, Artificial; Process for the Manufacture of —. J. J. Shedlock. Fr. Pat. 340,981, March 5, 1904.

THE mixture of coal dust and tar, for example, is made in a suitable closed vessel, from which the air is expelled by superheated steam or gas. The gaseous current volatilises the resinous matter and renders the material adhesive, whilst any volatile bodies are carried into a condenser and recovered.—W. H. C.

FRENCH PATENTS.

Coal Mine; Artificial —. R. J. P. Cottamin. Fr. Pat. 341,333, March 15, 1904.

VEGETABLE and mineral matters such as grasses, leaves, chalk, &c., are treated in closed tanks or pits with sewage, in order to obtain, by the action of bacteria, artificial coal, phosphates, sulphates, and ammonia.—W. H. C.

Liquid Air; Manufacture of — [Water-Gas, &c.]. Soc. L'Air Liquide (Soc. An. p. l'Étude et l'Exploitation des Proc. G. Claude). Fourth Addition, of Feb. 8, 1904, to Fr. Pat. 296,211, Jan. 16, 1900.

THE apparatus and processes described in Fr. Pat. 296,211, Jan. 16, 1900, and in the Additions thereto of Oct. 1900, and of June 1902, for the manufacture of liquid air, are now claimed as applicable, including the expansion of the compressed gases at low temperature, to water-gas, to low-grade gas, and the like. Compare Eng. Pats. 12,905 of 1900, and 27,658 of 1902; this J., 1901, 1018, and 1903, 1339.—E. S.

[Mineralised] Electrodes for Arc Lamps. A. Blondel. Third Addition, dated Feb. 4, 1904, to Fr. Pat. 323,813 of Aug. 18, 1902 (this J., 1903, 487).

ELECTRODES of the kind described in the main patent, having an external coating of pure carbon, are provided with a second sheath of carbon, baked beforehand at a very high temperature; the inner layer of carbon, which is attached directly to the mineralised core, serving to ensure a good electrical contact between the core and the outer highly baked layer.—H. B.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM, AND MINERAL WAXES.

Petroleum and its Distillation Products; Optical Examination of —. M. Rakusin. J. russ. phys.-chem. Ges., 1904, 36, 554—559. Chem. Centr., 1904, 2, 270.

THE colourless and also the yellow distillation products of petroleum, from benzine (petroleum spirit) up to spindle

oil, showed a dextro-rotation of $0^{\circ}2' - 2^{\circ}3'$ (saccharimeter degrees). Of the oils examined, yellow spindle oil from Baku showed the greatest rotation. Benzine and kerosene from Grosny petroleum, yellow American spindle oil ("Viscolite"), and solutions of Baku petroleum in benzine and benzene also showed a dextro-rotation.—A. S.

Methyl Alcohol; Determination of — in Products of Wood Distillation. M. J. Stritar and H. Zeidler. XXIII., page 841.

ENGLISH PATENTS.

Lubricants; Manufacture of Solid and Fluid Mineral —. P. J. Tabourin, Paris, J. Girard, Saone et Loire, and L. Portevin, Paris. Eng. Pat. 24,801, Nov. 14, 1903. Under Internat. Conv., Nov. 15, 1902.

See Fr. Pat. 326,348 of 1902; this J., 1903, 791.—T. F. B.

Solidifying Petroleum and other Mineral Oils for their Application as Fuel and for Lighting Purposes; Process for —. V. J. Kuess, Tunis. Eng. Pat. 7481, March 29, 1904. Under Internat. Conv., Nov. 6, 1903.

Ten kilos. of rosin, "or any other hydrocarbon of the turpentine series," is dissolved in 100 litres of petroleum, and 10 kilos. of melted animal fat is stirred in. A solution of 3 kilos. of caustic soda in 3 litres of water is then stirred in, and, after two hours, a litre of hydrochloric acid is added. After about four hours a further 2 kilos. of caustic soda, dissolved in 2 litres of water, is added, and the mixture, after standing two or three days, is heated "on a slow fire," under slight pressure, for about three hours, and poured into moulds. The resulting solid blocks are suitable for lighting, heating, and other purposes. (Compare Fr. Pat. 337,714, this J., 1904, 488.)—T. F. B.

UNITED STATES PATENTS.

Desulphurising Oils or Distillates; Process of —. O. P. Amend, New York. U.S. Pat. 764,099, July 5, 1904.

OILS or distillates are treated with alkali in excess of the amount required to neutralise the acids present, and are then agitated with copper sulphate, thus precipitating copper sulphides. The product is now oxidised, e.g., by addition of "ferrous hydrate" and injection of steam, to convert the copper compounds to sulphate, which is removed, and the oil is allowed to settle.—T. F. B.

Combustible Gas from Petroleum-Oil or other Hydrocarbon Fluids; Apparatus for Producing —. C. A. Kuenzel. U.S. Pat. 764,601, July 12, 1904. II., page 816.

IV.—COLOURING MATTERS AND DYE STUFFS.

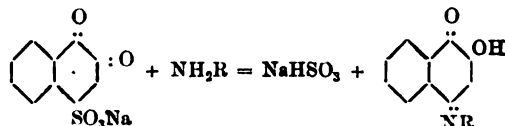
Ethylbenzylaniline. G. Schultz, O. Rohde, and E. Bosch. Annalen, 1904, 334, 235–264.

p-NITROETHYLBENZYLANILINE was obtained by adding hydrochloric acid and sodium nitrite to the alcoholic solution of ethylbenzylaniline. The product was extracted with ether after liberation by addition of sodium carbonate. The ethereal extract is green. A subsequent ethereal extract was dark red, but no definite substance could be isolated from it. The yield was about 70 per cent. of the theoretical amount and benzaldehyde was always formed as a by-product. *p*-Nitrosoethylbenzylaniline forms steel-blue plates and is quite analogous in its reactions to *p*-nitrosodimethyl-aniline. Thus it condenses with β -naphthol to form an oxazine dyestuff, which is of a purer blue shade than its analogue, Meldola's Blue. A hydrochloride of *p*-nitroso-ethylbenzylaniline was prepared, but is decomposed by water. On nitration of ethylbenzylaniline by adding nitrosulphuric acid to its solution in strong sulphuric acid in the cold, the authors obtained mainly *m*-nitrobenzylethylaniline, together with a little *p*-nitrobenzylethylaniline. This does not agree with the results of Gnehm and Schentz (J. pr.

Chem., 1901, 63, 426), who state that they obtained *p*-nitro-ethylbenzylaniline. The *m*-compound forms reddish-brown prisms, and the *p*-compound yellow rhombs. *o*-Nitrobenzylethylaniline was obtained synthetically from *o*-nitrobenzylchloride and ethylaniline. All these nitrobenzylethylanilines form white hydrochlorides, decomposed by water. *o*-Nitro-ethylbenzylaniline was obtained as a reddish-brown oil, which refused to crystallise, by the action of *o*-nitro-bromobenzene on ethylbenzylaniline. It is more basic in properties than *o*-nitrobenzylethylaniline. The authors also attempted to oxidise *p*-nitroso-ethylbenzylaniline to the *p*-nitro compound. A large number of oxidising agents were employed, but a crystalline product could only be obtained by oxidation with dilute nitric acid, and in this case a dinitro product was obtained. The same product was obtained by the action of fuming nitric acid on ethylbenzylaniline dissolved in a little glacial acetic acid. It shows no basic properties. *p*-Nitro-ethylbenzylaniline was obtained by nitrating ethylbenzylaniline, dissolved in 30 times its weight of glacial acetic acid, with the calculated amount of fuming nitric acid. The product was isolated with some difficulty. After reduction to the corresponding amino compound it gives the Methylene Blue reaction, which proves the *p*-position of the nitro group. It shows no basic properties. The authors find that the method of preparing aminobenzylethylanilines by adding nitrobenzyl chlorides to aniline, and at once reducing with iron and hydrochloric acid, described in Ger. Pat. 56,908, does not lead to the required result, aniline and toluidine being formed by decomposition of the molecule. Other reducing agents led to the same result. The amino compounds cannot be obtained by reduction of the formed nitro compounds for similar reasons. *p*-Amino-ethylbenzylaniline was obtained from *p*-nitroso-ethylbenzylaniline by reduction with zinc dust and dilute sulphuric acid. This base gives the Methylene Blue reaction. It is oxidised by the air. It also yields well-defined benzoyl and acetyl derivatives. After diazotisation it couples with β -naphthol to form an azo dyestuff which, after crystallisation, forms black crystals with a green lustre, which are red by transmitted light.—E. F.

Naphthoquinonesulphonic Acid; Applications of —. P. Ehrlich and C. A. Herter. Z. physiol. Chem., 1904, 41, 379–392. Chem. Centr., 1904, 2, 112–114.

WITT'S 1.2-naphthoquinone-4-sulphonic acid combines with all aromatic mono- and diamines, the dyestuffs produced being mostly orange when a monamine is used; a dimethyl-amino group in the para-position causes a change of colour from orange to violet. The acid also forms dyestuffs with so-called acid methylene compounds, resorcinol, phloroglucinol, secondary amines (piperidine, diamylamine, methyl-aniline), and also with bodies such as peptone, tyrosine, and uric acid. The reaction with amines proceeds according to the equation—

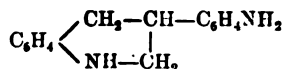


The condensation products are insoluble in water; by the introduction of an acid (COOH , SO_3H) group, they become soluble in alkali, and by the introduction of amino groups, soluble in acids. Among the "acid methylene" compounds from which dyestuffs were prepared were nitromethane, nitrotoluene, acetylacetone, benzoylacetone, acetoacetic ester, benzoyl acetic ester, desoxybenzoin, cyanacetamide, phenylpyrazolone and rhodanic acid.—A. S.

Dyestuffs; New [Azo and other] —. L. Paul. Chem.-Zeit., 1904, 28, 702–704.

WHEN amines are heated at about 220°C . with glycerin which has previously been freed from water by heating at $230^{\circ} - 240^{\circ}\text{C}$., compounds are formed belonging to three classes:—(1) L-bases, soluble in hydrochloric acid and diazotisable; (2) S-bases, soluble in hydrochloric acid and not diazotisable; and (3) Rx-compounds, apparently feeble

dyestuffs, which are neither soluble in hydrochloric acid nor diazotisable. The L-base (A L-base, prepared from aniline) of the probable formula—



forms a greyish powder. On being diazotised and combined with salt-R, it yields a Ponceau which dyes wool similarly to the ordinary azo-Ponceaux; with resorcinol, it gives a yellow azo compound. This base is also formed from phenylhydrazine hydrochloride and glycerin. The L-base from benzidine (B L-base) dissolves readily in ether and 50 per cent. alcohol. Treated with nitrous acid, it gives a tetrazo compound which combines with phenols, &c., the compounds formed being more soluble and yellower in shade than the corresponding benzidine compounds. Bases were similarly obtained from sulphanilic acid, α -naphthylamine, p -aminoacetanilide, p -nitraniline and other amines. The products obtained by the L reaction from p -nitraniline, α -naphthylamine, dimethylaniline, m - and p -phenylenediamine, and other bases are for the most part more soluble than the bases from which they are derived. It would thus appear possible that the reaction may be of general utility in obtaining derivatives of greater solubility from sparingly soluble amines. In the case of m -phenylenediamine, the glycerin appears to take no part in the reaction, but to act solely as a solvent. On heating proportions of glycerin (30 c.c.) and of the hydrochloride salt (3.6 grms.) similar to those found most suitable for the preparation of the AL- and BL-bases, no diazotisable base is obtained. With a much larger proportion of the salt (25 grms. and 50 c.c. of glycerin) a different reaction takes place. Hydrochloric acid and ammonia are evolved and a diazotisable base is formed which dissolves readily in acetic acid, and from this solution dyes cotton mordanted with tannic acid in brown shades, which are very fast to light. On sulphonation, the base yields two sulphonic acids. When resorcinol (25 grm.) is heated with a small proportion of zinc chloride (5 grms.), two dyestuffs are obtained. That which is chiefly produced (yield—60 per cent.), when precipitated from its alkaline solution by sodium bisulphate, dyes silk a salmon-pink colour. It yields two sulphonic acids, which differ greatly in solubility, the more soluble dyeing wool in orange-red shades. With a larger proportion of zinc chloride (25 grms.) the dyestuff which with less of this reagent is formed in smaller amount (yield, 1½ per cent.), is chiefly produced. It dyes wool and silk in yellowish-brown colours and has greater dyeing power than the other dyestuff. The bromo derivatives of both compounds are bluish-red dyestuffs; their sulphonic acids dye wool in bright scarlet shades. A mixed dyestuff is obtained by adding m -phenylenediamine hydrochloride (7 grms.) to resorcinol (14 grms.) heated to a little below its boiling point. It dissolves in alkalis, and from a bath prepared by precipitating it in a fine state of division by the addition of an acid salt to its alkaline solution, it dyes wool and cotton in orange shades. It yields two sulphonic acids. Dimethyl- m -phenylenediamine hydrochloride gives with resorcinol a dyestuff of bluish shade soluble with difficulty.—E. B.

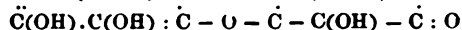
Galloflavin and Reso-flavin. J. Herzig and R. Tscherne. *Monatsh. f. Chem.*, 1904, 25, 603—610.

GALLOFLAVIN was first prepared by Bohn, and Bohn and Graebe, after investigating it, proposed $\text{C}_{15}\text{H}_8\text{O}_6$ as its most probable formula. The authors have re-examined the pure compound and its acetyl and methyl derivatives, and find that the analytical results correspond best with the formula $\text{C}_{15}\text{H}_8\text{O}_{10}$ or $\text{C}_{15}\text{H}_8\text{O}_6(\text{OH})_4$. The methyl derivative was prepared by treating galloflavin with excess of diazomethane in ethereal suspension. An interesting point is that whilst acetyl-galloflavin (m. pt. 232°—234° C.) can be obtained in almost white crystals, the crystals of methyl-galloflavin (m. pt. 235°—237° C.) have a distinct yellow tinge. Reso-flavin, obtained by the oxidation of s -dihydroxybenzoic acid has similar properties to galloflavin. Its acetyl derivative (m. pt. 274°—277° C.) is white, and its methyl derivative (m. pt. 282°—283° C.) distinctly yellow. The high melting points of the acetyl and methyl derivatives of the two com-

pounds point to high molecular weights, and the authors consider it not improbable that the molecule of galloflavin is larger than $\text{C}_{15}\text{H}_8\text{O}_{10}$; the analytical figures would answer just as well for a multiple of $\text{C}_3\text{H}_2\text{O}_2$.—A. S.

Gallobromine, a Dyestuff Derived from Dibromogallic Acid. P. Sisley. *Rev. Gén. Mat. Col.*, 1904, 8, 225—227.

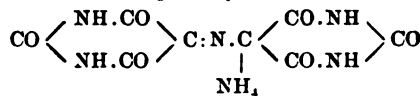
DIBROMOGALLIC acid (50 parts) is dissolved in alcohol (300 parts), formaldehyde (30 parts of 40 per cent. aqueous solution) added, and sulphuric acid (300 parts of 98 per cent. strength) gradually run in, the solution being constantly agitated. After the mass has been left at rest for 12 hours, it is poured into water, the precipitate being collected, washed, and dried. The yield amounts to about 50 per cent. of the dibromogallic acid taken. The crude dyestuff obtained was purified by dissolving it in a solution of sodium carbonate. After purification it was finally obtained in the form of a dark brown powder. It is almost insoluble in water, soluble with a reddish-purple colour in alcohol, acetic acid, &c., with a bluish purple colour in dilute alkali solutions. It dyes metallic oxide mordants in shades closely resembling those of the corresponding logwood combinations. The dyeings are faster to soaping than those of logwood, but not fast to light. Gallobromine can also be prepared by brominating trihydroxyfluorone dicarboxylic acid (see Möhlau, this J., 1898, 371), and its formula must therefore be—



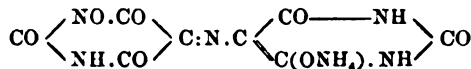
The reddish dyestuff which is formed along with "gallobromine" from dibromogallic acid, is probably dibromotrihydroxyfluorone.—E. B.

Purpuric Acid and Murexide; Constitution of —. R. Möhlau. *Ber.* 1904, 37, 2686—2691.

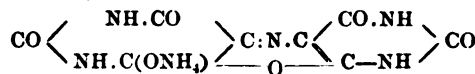
FROM the results of his investigations, on similar lines to those of Piloty and Finckh (this J., 1904, 656), and from theoretical considerations, the author concludes that the formula of murexide is probably—



or—



the first being a pseudo form of the other. He therefore comes to the same essential conclusions as Piloty and Finckh (*loc. cit.*) and as Slimmer and Stieglitz (this J., 1904, 656). He considers an alternative formula—



proposed by Piloty to be unlikely in view of the instability of inurexide.—E. F.

ENGLISH PATENTS.

Tetrazophenol Sulphonic Acid; Manufacture of a —. O. Imray. From Farb. vorm. Meister, Lucius und Brüning. Hoechst-on-Maize, Germany. Eng. Pat. 18,283, Aug. 24, 1903.

If the disulphonic acid obtained by sulphonating m -phenylenediamine is diazotised in the usual manner, a mixture of a diazo-compound and of a Vesuvine dyestuff is formed. If the dyestuff formation is avoided as much as possible, which can be done by using considerably more than the theoretical quantity of nitrite, and ensuring the continuous presence of at least one molecule of nitrous acid in excess, a good yield of tetrazophenolsulphonic acid is obtained, one sulphonic acid group being replaced by a hydroxyl group. The operation is carried out by running the solution of diamino-acid and nitrite into mineral acid, or by rapidly mixing the mineral acid with the solution of diamino-acid and nitrite, or by rapidly mixing nitrite solution with that of the diamino-acid and mineral acid.

Thus a solution of 1 mol. of the sodium salt of the diamino-disulphonic acid and 2.4 mols. of nitrite may be run at the ordinary temperature below the surface of excess of dilute hydrochloric acid. The tetrazophenolsulphonic acid separates partly as yellow crystals.—E. F.

Sulphurised Dyestuffs [Sulphide Dyestuffs]; Manufacture of Clear Yellow, Orange Yellow to Yellow Orange — O. Imray. From Farb. vorm. Meister, Lucius und Brünig, Höchst-on-Maine, Germany. Eng. Pat. 21,945, Oct. 12, 1903.

THE dyestuffs are obtained by heating to a high temperature *m*-toluylenediamine, or the products obtained by the action of carbon bisulphide on *m*-toluylenediamine, or the products obtained by heating the last-mentioned products, with sulphur and an aromatic base, such as benzidine, or with sulphur and formanilide. To make the products technically useful, they are then heated with sodium sulphide and dried *in vacuo*. Thus, for instance, equal molecules of *m*-toluylenediamine and formanilide are introduced into 28 atomic proportions of molten sulphur, preferably at about 110°–130° C. The temperature is gradually raised to 210°–220° C. The dyestuff changes from yellow to orange yellow. When cold, the melt is pulverised and introduced at about 80° C. into 2½ times its weight of sodium sulphide, heated to 135° C., and dried.—E. F.

Colouring Matters [Sulphide Dyestuffs]; Production of — Read Holliday and Sons, Ltd., J. Turner, H. Ilean, and J. Turner, Huddersfield. Eng. Pat. 18,924, Sept. 2, 1903.

THE yellow nitro dyestuff prepared, according to Eng. Pat. 22,078 of 1902 (see this J., 1903, 1081) by nitrating dinitrodiphenylaminesulphonic acid, is heated alone, or with an equal weight of *m*-dinitro-*p*-hydroxydiphenylamine, with sulphur and sodium sulphide. The resulting dyestuffs dye vegetable fibres greenish-black or black from a bath containing sodium sulphide.—T. F. B.

Halogenised Nitro Compounds. H. H. Lake. From K. Oehler, Offenbach-on-Maine, Germany. Eng. Pat. 10,678, May 9, 1904.

1,2,4-Dichloronitrobenzene is obtained by the action of chlorine on molten *p*-chloronitrobenzene in presence of a suitable carrier such as anhydrous ferric chloride, iron, antimony pentachloride, iodine or phosphorus pentachloride. The most advantageous temperature for the reaction is 105° C. When phosphorus pentachloride is used it is advantageous to raise the temperature to 150° C. When the mass has increased in weight by the theoretical amount, it is poured into water and washed with water at 50° C. The product is thus obtained in theoretical quantity and sufficiently pure for technical use. It can be distilled without decomposition at 750 mm. pressure and 256–260° C.—E. F.

UNITED STATES PATENTS.

Sulphur Dye [Sulphide Dyestuff]; Black —, and **Process of Making same.** R. Lauch, Uerdingen, Germany. U.S. Pat. 764,733, July 12, 1904.

A SOLUTION of *p*-aminodinitrodiphenylamine in certain solvents is heated with sulphur and an alkali sulphide to about 190° C. The product is black, rather hygroscopic, and soluble in cold sodium sulphide solution with greenish colour, becoming blue with further sodium sulphide. This solution becomes bluish-black on oxidation in the air and yields a black precipitate with mineral or acetic acid. The dyestuff yields on unmordanted cotton from an alkali sulphide bath deep black shades without further oxidation, remarkably fast and improved by further treatment with metallic salts such as bichromates and copper sulphate, characterised by fastness to acid, alkali and light.—E. F.

Sulphur Dye [Sulphide Dyestuff]; Direct Cotton —, and **Process for Making same.** R. Lauch, Uerdingen, Germany. U.S. Pat. 764,734, July 12, 1904.

p-AMINODINITRODIPHENYLAMINE is boiled with sulphur and sulphides in presence of certain diluting agents. The product is a violet-black powder, dissolving in sodium

sulphide solution to a violet liquid, and dyeing unmordanted cotton directly from a sodium sulphide bath. The dyeings are improved by further treatment with metallic salts.

—E. F.

Sulphur Dyes; Process of Making Stable — R. Lauch, Uerdingen, Germany. U.S. Pat. 764,735, July 12, 1904.

THE dyestuffs obtained by the action of sulphur and alkali sulphide on *p*-aminodinitrodiphenylamine are rendered stable by exposing them in a powdered state to the action of air.—E. F.

Azo-Colour [Azo-Dyestuffs]; Red — P. Julius and C. Winter, Assignors to Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, Germany. U.S. Pat. 765,079, July 12, 1904.

o-Chloro-*p*-toluidine is diazotised and coupled with 2-naphthol-3,6-disulphonic acid. The sodium salt of the dyestuff is brilliantly red and soluble with difficulty in cold, but easily in hot water. The barium lake of the dyestuff is brilliant red in colour and practically insoluble in water.

—E. F.

Azo-Colour [Azo-Dyestuff]; Yellow-Red — P. Julius and F. Osthelder, Assignors to Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, Germany. U.S. Pat. 765,080, July 12, 1904.

o-Chloro-*p*-toluidine is diazotised and coupled with β -naphthol. The product is a yellowish-red dyestuff yielding a yellowish-red lake when mixed with a substratum.

—E. F.

Cyanmethylantranilic Acid; Omega — O. J. Graul, Assignor to the Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, Germany. U.S. Pat. 765,576, July 19, 1904.

SEE Eng. Pat. 14,676 of 1903; this J., 1904, 604.—E. B.

Azo Dyestuff, and Process of Making same. P. Julius and S. Haeckl, Assignors to Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine. U.S. Pat. 765,581, July 19, 1904.

SEE Eng. Pat. 16,995 of 1903; this J., 1904, 712.—T. F. B.

Indigo; Process of Purifying — P. E. Oberreit, Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine. U.S. Pat. 765,590, July 19, 1904.

SEE Eng. Pat. 7395 of 1903; this J., 1904, 243.—T. F. B.

Anthrarufin; Process of Making — [Anthracene Dyestuffs]. R. E. Schmidt, Elberfeld, and P. Tust, Vohwinkel, Assignors to Farbenfabr. of Elberfeld Co., New York. U.S. Pat. 765,201, July 19, 1904.

SEE Fr. Pat. 336,867 of 1903; this J., 1904, 438.—T. F. B.

Chrysazin; Process of Making — [Anthracene Dyestuffs]. R. E. Schmidt, Elberfeld, and P. Tust, Vohwinkel, Assignors to Farbenfabr. of Elberfeld Co., New York. U.S. Pat. 765,637, July 19, 1904.

SEE Fr. Pat. 336,867 of 1903; this J., 1904, 438.—T. F. B.

FRENCH PATENTS.

Indigo Dyestuffs; Process for Producing — from Leuco-Compounds, obtained from Phenylglycin and its Derivatives by means of Alkali Amides. Cie. Paris. Coul. d'Aniline. Fr. Pat. 338,824, May 26, 1903.

SEE Eng. Pat. 11,630 of 1903; this J., 1904, 438.—T. F. B.

[Indigo Dyestuffs] **Indoxyl, and its Homologues and their Derivatives; Production of** — Fabr. Baloise de Prods. Chim. Fr. Pat. 340,695, Feb. 24, 1904.

SEE U.S. Pat. 761,440 of 1904; this J., 1904, 712.—E. F.

Acetyldiaminophenolcarbonic Acid and Azo - Dyestuffs derived therefrom; Preparation of — Soc. L. Cassella et Cie. Fr. Pat. 338,844, June 5, 1903.

p-AMINOSALICYLIC acid is acetylated in the usual manner, nitrated in strong sulphuric acid solution at 5°–10° C.

with strong nitric acid, and the nitro-acetylaminophenol-carbonic acid so obtained is reduced, preferably with iron and acetic acid. The 1-hydroxy-2-amino-4-acetylaminobenzene-6-carboxylic acid so obtained is isolated in the usual manner. It is soluble with difficulty in water, the salts being easily soluble. With nitrous acid it forms a golden-yellow diazo compound, very insoluble in water, and combining with naphthols, dihydroxynaphthalenes, aminonaphthols, and their sulphonic acids to form mordant azo dyestuffs which are much bluer in shade, more even, and faster to light than those derived from 1-hydroxy-6-aminobenzene-2-carboxylic acid. Thus, with β -naphthol, a dyestuff is obtained dyeing wool from an acid-bath in Bordeaux red shades turning to violet when treated with bichromate. With aminonaphtholsulphonic acid H a product is obtained dyeing unmordanted wool in violet shades, which become bright blue on treatment with bichromate.

—E. F.

Acid Cyanides [ω -Cyanomethylamine Derivatives]; *Production of* —. Badische Anilin und Soda Fabrik. Fr. Pat. 338,818, Dec. 5, 1903. Under Internat. Conv., Oct. 24, 1903.

SCHIFF's bases, produced by condensing an aromatic amine with an aldehyde, are converted into the corresponding nitriles of the general formula $R.NH.CH(R')CN$ on treatment with hydrocyanic acid. ω -Cyanomethylamine is produced by stirring 110 grms. of anhydroformaldehyde-aniline into a solution of 70 kilos. of potassium cyanide in 200 litres of water and 300 kilos. of ice, to which the theoretical quantity of acid has been added; the mixture is heated at 100° C. for two hours in an autoclave, and the product filtered off. (See also Eng. Pat. 14,676 of 1903; this J., 1904, 604.)—T. F. B.

Orthohydroxy Azo Dyestuffs susceptible to Chroming on the Fibre; Production of —. Badische Anilin und Soda Fabrik. Fr. Pat. 338,819, Dec. 17, 1903. Under Internat. Conv., Nov. 27, 1903.

α -NAPHTHYLAMINE di- or tri-sulphonic acids, which have one sulphonic group in the *o*-position to the amino group, are diazotised, and the diazo compounds allowed to stand in neutral solution, or with dilute acid, or with alkali acetates or carbonates; the *o*-hydroxydiazonium compounds thus produced, when coupled with β -naphthol, give dyestuffs which dye wool violet-red to red-brown shades, converted to deep blue or bluish-black on chroming.—T. F. B.

Dyestuffs of the Anthracene Series [Indanthrene Dyestuffs]; Production of Grey —. Badische Anilin und Soda Fabrik. Fr. Pat. 341,126, Jan. 12, 1904.

1.5-, 1.8-, 1.3-, 2.6-, or 2.7-Diamino-anthraquinone is fused with potassium hydroxide at 180°–200° C. The sulphonic acids of these diamines may also be used. The melt is boiled with water, and the insoluble dyestuff separated by filtration. The products form reddish-grey to olive-grey pastes, and, when dry, black powders, almost insoluble in ordinary solvents. Their properties resemble those of Indanthrene and Flavanthrene. They dye the vegetable fibres from a reduction vat containing alkali hydroxide in bluish-grey to reddish-grey shades, and can also be used for printing. The dye-liquor is brown in colour. The dyeings are remarkably stable. The dyestuffs from the 1.5- and 1.8-diamines give reddish, those from the 1.3-, 2.6-, and 2.7-diamines give greenish shades.

—E. F.

Anthraquinone Derivatives [Anthracene Dyestuffs]; New Process for the Production of —. Soc. Anon. Prod. F. Bayer et Cie. Fr. Pat. 340,517, Feb. 17, 1904.

1.4-AMINOHYDROXYANTHRAQUINONE, 1.4-alkylamino-hydroxyanthraquinones, and sulphonic acids of these compounds are obtained by heating α -aminoanthraquinone, α -alkylaminoanthraquinone, and their sulphonic acids with fuming, 100 per cent. or ordinary concentrated sulphuric acid, with or without addition of boric acid. The products either serve for the production of, or are themselves, dyestuffs of technical value. The product obtained from α -methylaminoanthraquinone with 20 per cent. fuming sulphuric acid and boric acid at 150°–160° C., which is

probably 1-methylamino-4-hydroxyanthraquinone-2-sulphonic acid, dyes unmordanted wool in violet and chrome-mordanted wool in blue shades. 1-Methylamino-4-hydroxyanthraquinone-5-sulphonic acid, from 1-methylaminoanthraquinone-5-sulphonic acid, has similar dyeing properties.

—E. F.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

Dyeing [Mordanting] Process. VI. Theories of the Mordanting Process. P. Heermann. Färber-Zeit., 1904, 15, 165–170, 183–188, 197–200, 214–219.

FIVE theories which have been suggested to explain the mordanting process are discussed with respect to the following practical matters of experience: (1) the nature of the fibre has a great influence on the result; (2) the mordant cannot be rubbed off the fibre, or boiled out of it; (3) the duration of treatment and the temperature, concentration, and basicity of the mordant bath have very great influence on the ultimate result (see this J., 1903, 361 and 623, and 1904, 57 and 439); (4) the efficiency of a mordant is not proportional to its ionisation; (5) the temperature of the mordant bath rises during the process; (6) chemically indifferent compounds (fibre and mordant) take part in the process; (7) the fibre is not altered structurally or chemically by the process, and can be obtained in its original form by dissolving out the mordant base; (8) the basicity of the mordant (see this J., 1904, 439) remains constant during the process; (9) the mordant base (on the fibre) is capable of further combination and reaction; (10) the ratio between the weights of mordant and fibre influence the result of the operation. The "impregnation" theory is contradicted by facts (1), (2), (3), (4), (5), and (10), and is quite untenable; the "solution" theory does not agree with facts (3) and (8) and possibly (6) and (9); the "organo-metallic" theory (assuming the formation of compounds of the fibre and the mordant base) is not compatible with facts (3), (6), (7), (8), and (9); the "catalytic" theory (assuming that the fibre acts as a catalytic agent, decomposing the mordant, and precipitating a basic salt on the fibre) and the "ionic" theory (that the affinity of a fibre for a mordant depends on the ionisation of the mordant, and on the difference between the electro-affinities of the mordant ion and of the fibre) are both proposed by the author as agreeing with all the observed facts; the latter is preferred, as, although the former does not appear to have any flaw, the explanation of the various facts seem in some cases less simple than in the case of the "ionic" theory.—T. F. B.

ENGLISH PATENTS.

Dyeing; Apparatus for — and for similar Purposes. L. Mascelli, Milan. Eng. Pat. 20,476, Sept. 23, 1903.

SEE Fr. Pat. 335,949 of 1903; this J., 1904, 320.—T. F. B.

Dyeing Hanks of Yarn; Apparatus for —. G. Stöhr, Magdeburg, Germany. Eng. Pat. 9311, April 22, 1904.

A FRAME serving as a holder for transversely fixed rods upon which hanks of yarn are loosely placed is so constructed as to be capable of being conveyed into and out of a dye-tank, and is so mounted that, when raised out of the tank, it may be rotated around a horizontal axis through an angle of 180°. Those parts of the hanks which were at the top during one immersion in the dye-bath are thus brought to the bottom for the next immersion.—E. B.

UNITED STATES PATENTS.

Mercerising [Yarns]; Apparatus for —. J. E. Palmer, Middleton, Conn. U.S. Pat. 765,898, July 19, 1904.

THE apparatus claimed is designed for the purpose of stretching yarns, when these are being mercerised in the form of hanks, on the inside as well as on the outside of the hanks. It comprises (1) a stretching frame, (2) two reels, engaging the hanks on the inside, one of which is mounted in stationary, the other in movable, bearings, and

both of which are laterally adjustable to facilitate the insertion and removal of the hanks, and (3) one or more laterally adjustable intermediate reels, engaging the hanks on the outside.—E. B.

Printing Yarns; Apparatus for —. W. Shaw, Brooklyn, N.Y. U.S. Pat. 765,326, July 19, 1904.

SEE Eng. Pat. 12,483 of 1898; this J., 1898, 846.—E. B.

FRENCH PATENTS.

Viscose; Automatic Machine for Fixing Filaments of —. Soc. Franç. de la Viscose. Fr. Pat. 340,812, Feb. 27, 1904.

THE skeins of viscose threads are supported on a pair of rollers, mounted in a vertical plane, in a vat. An acid sprinkler is supported over the upper roller, which is fixed in position. The lower roller can be raised or lowered by means of a pump, to permit the skeins being put in position or removed. Each of the rollers can be rotated by belts from the same shaft, which is fitted with an arrangement of cams, whereby each roller may be caused to perform a portion of a revolution alternately, thus constantly altering the position of the skeins on the rollers and ensuring regular "fixation."—T. F. B.

Dyeing and Bleaching of Textile Materials; Apparatus for —. F. Scharmann. Fr. Pat. 340,736, Feb. 26, 1904.

THE machine consists of a closed vertical, cylindrical vessel in which are placed two concentric, perforated cylinders, between which is packed the material to be treated. The space contained by the inner perforated cylinder is connected to a circulating pump, and by a suitable arrangement of partitions and valves the liquid is made to pass in various directions through the material contained between the two perforated cylinders.—A. B. S.

Dyeing and Bleaching; Apparatus for —. F. Scharmann. Fr. Pat. 340,792, Feb. 26, 1904.

IN the centre of the dye vessel a compartment is formed by means of a number of superimposed segments. A man stands in this compartment and packs the material to be treated, in the surrounding portion of the dye vessel, on a perforated false bottom. As the depth of the material increases, extra sections are placed on the central compartment until the vessel is full, when the material is covered with a perforated cover. By means of a circulating pump which is connected with the central and outer parts of the vessel, the dye or bleaching liquor is forced up through the material, passes through the perforated top plate and overflows into the central compartment, and then back into the pump. The liquids can be heated with steam-coils placed under the false bottom of the outer vessel.—A. B. S.

Printing with Indigo by means of Hydrosulphites; Process for —. Cie. Paris. Coul. d'Aniline. Fr. Pat. 338,831, May 30, 1903.

SEE Eng. Pat. 13,116 of 1903; this J., 1904, 544.—T. F. B.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

UNITED STATES PATENT.

Dyeing Skins; Apparatus for —. P. Bruffaers, Schaerbeek, Belgium, Assignor to H. M. Peyser, Boston, U.S.A. U.S. Pat. 765,375, July 19, 1904.

SEE Fr. Pat. 336,992 of 1903; this J., 1904, 440.—T. F. B.

FRENCH PATENT.

Pearly Effects on Paper, Card, &c.; Process for Obtaining —. P. Dejeu. Fr. Pat. 338,820, May 26, 1903.

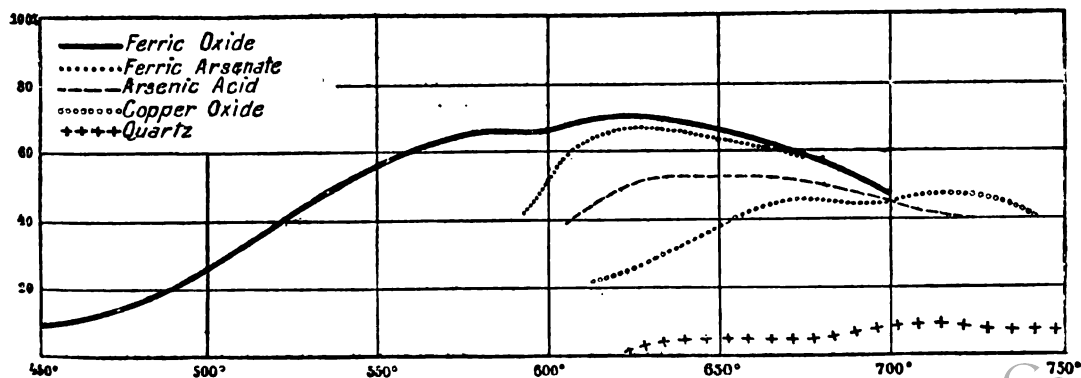
PEARL-LIKE effects are produced on paper, &c., by coating it with a hot composition of lead acetate (80 parts), gelatin (5 parts) and glycerin (1 part), and allowing the acetate to crystallise in a strong current of air, or in any other manner which will produce wavy lines or designs on the surface.

—T. F. B.

VII.—ACIDS, ALKALIS, AND SALTS.

Sulphur Trioxide; Catalytic Production of —. G. Lunge and K. Reinhardt. Z. angew. Chem., 1904, 17, 1041–1051.

THE authors have extended the work of Lunge and Pollitt (this J., 1903, 79), using, however, an electric resistance furnace to heat the tube containing the contact substance, by which means accurate regulation of the temperature, and thus determination of the influence of varying temperatures, is made possible. Lunge and Pollitt's method of passing a stream of mixed sulphur dioxide and air over the heated contact substance, and determining the composition of the mixture before and after contact, was retained; for though it has disadvantages, yet it imitates the conditions of the process as carried out on the industrial scale. The temperature was determined by a Le Chatelier thermo-electric pyrometer, and was found to be very nearly constant for the same strength of current. The results of the several series of observations are as follow:—1. With pure ferric oxide (Aguas Teñidas burnt pyrites), catalytic action begins, under favourable conditions, at about 400° C., and reaches its maximum at 625° C., at which temperature about 70 per cent. of the total sulphur dioxide is converted. 2. Drying the gases by phosphorus pentoxide instead of by ordinary concentrated sulphuric acid is practically without influence on the action. 3. When the burnt pyrites was impregnated with arsenic trioxide, the results in the most favourable case were practically the same as those with ferric oxide alone; they agreed with Lunge and Pollitt's results for ferric oxide containing arsenic, but were higher than those experimenters obtained with ferric oxide alone. 4. Pure ferric arsenate prepared in the wet way gave the same maximum conversion (70 per cent.) at the same temperature (625° C.) as ferric oxide, but ferric arsenite



acted much less favourably (it is doubtful whether the substance prepared and used as ferric arsenite is really a definite compound). 5. Pure arsenic pentoxide also acts as a strong catalyst, giving about 55 per cent. of conversion as a maximum at a temperature of 680° C. 6. The addition to ferric oxide of small quantities of cupric oxide or sulphate is without influence, but larger quantities act prejudicially, and the effect of cupric oxide alone is still less (48–50 per cent. conversion at 680°–740° C.). 7. Jena glass and glazed or unglazed porcelain are almost without action; their catalytic effect is just perceptible at 700° C. Silica, on the other hand, whether as rock crystal or as amorphous quartz, has a very perceptible action (about 10 per cent. conversion at 700° C.). The accompanying diagram, in which the abscissæ are temperatures and the ordinates percentages of conversion, summarises the results.

—J. T. D.

Chromates of Zinc and Cadmium. M. Gröger. *Monatsh. f. Chem.*, 1904, 25, 520–536.

THE author has examined the action of potassium, sodium, and ammonium chromates on solutions of zinc and cadmium salts, in a manner similar to that in which he previously (*Sitzungsber. d. k. k. Akad. d. Wiss.*, Wien, 1903, 112, 116, 263) examined their action on copper salts. The results of the investigation may be summarised as follows:—When different alkali chromates are allowed to act upon solutions of the chlorides of copper, zinc, and cadmium, sodium chromate precipitates a basic chromate of the heavy metal, whilst potassium and ammonium chromates give precipitates of double chromates. Except in the case of the cadmium double chromates, the composition of the precipitate varies according to whether an excess of the salt of the heavy metal or of alkali chromate be used. The precipitates obtained with excess of the alkali chromate generally have a composition varying with the concentration of the reacting solutions; they are probably not definite compounds, but mixtures containing varying proportions of the more stable double chromates produced when excess of the salt of the heavy metal is used. An exception occurs however in the case of zinc chloride and ammonium chromate, the compound obtained with excess of the chromate being more permanent than that precipitated when excess of zinc chloride is present. The double chromates are all decomposed by water, the final products in the case of the zinc and copper compounds being $\text{ZnCrO}_4 \cdot 3\text{Zn}(\text{OH})_2$ and $\text{CuCrO}_4 \cdot 2\text{Cu}(\text{OH})_2$ respectively. Some of the compounds produced were as follows:—From zinc chloride (excess) and potassium chromate, $4\text{ZnO} \cdot \text{K}_2\text{O} \cdot 4\text{CrO}_3 \cdot 3\text{H}_2\text{O}$; zinc chloride and sodium chromate, $4\text{ZnO} \cdot \text{CrO}_3 \cdot 3\text{H}_2\text{O}$; zinc chloride and ammonium chromate (excess), $2\text{ZnO} \cdot (\text{NH}_4)_2\text{O} \cdot 3\text{CrO}_3 \cdot \text{H}_2\text{O}$; cadmium chloride and potassium chromate, $4\text{CdO} \cdot \text{K}_2\text{O} \cdot 4\text{CrO}_3 \cdot 3\text{H}_2\text{O}$; cadmium chloride and ammonium chromate, $4\text{CdO} \cdot (\text{NH}_4)_2\text{O} \cdot 4\text{CrO}_3 \cdot 3\text{H}_2\text{O}$; cupric chloride (excess) and potassium chromate, $4\text{CuO} \cdot \text{K}_2\text{O} \cdot 4\text{CrO}_3 \cdot 3\text{H}_2\text{O}$.—A. S.

Dissolved Substances; Alteration of the Concentration of and Crystallisation of — by Centrifugalising. R. P. Van Calcar and C. A. Lobry de Bruyn. *Rec. trav. chim. Pays-Bas*, 1904, 23, 218–223. *Chem. Centr.*, 1904, 2, 5.

THE experiments were made with solutions of potassium thiocyanate, ferrocyanide and iodide, saccharose and Glauber's salt. After centrifugalising, samples were taken at four different points from the periphery inwards. In all cases, an enrichment of the peripheral portion in dissolved substance was observed. For example a 0.2-N potassium iodide solution was centrifugalised for three hours in an apparatus working at 2400 revolutions per minute. The four samples then gave the following results:—(1) from inner portion ...; (2) 0.1-N; (3) 0.32-N; (4) from outer portion, 0.25-N. A crystallisation of the dissolved substance under the action of centrifugal force was observed with a solution of Glauber's salt containing 8.78 per cent. of sodium sulphate. After centrifugalising for five hours, a large quantity of crystals of $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$ was filtered off, whilst the residual solution contained only 5.54 per cent. of sodium sulphate.—A. S.

Ozone; Formation of — at High Temperatures. J. K. Clement. *Ann. der Physik*, 1904, 14, 334–353. *Chem. Centr.*, 1904, 2, 79–80.

If oxygen be led rapidly over a Nernst's incandescent body at about 2,200° C., and then passed into potassium iodide solution, iodine is separated so long as the apparatus contains nitrogen, the separation being effected by the nitric oxide formed. No formation of ozone occurs, since if nitrogen be not present in the apparatus no iodine is separated. Also with an incandescent body cut into pieces, so that it acted both as an incandescent and an arc lamp, and which had a temperature of about 3,000° C., no formation of ozone could be observed. Ozone was decomposed completely by passing through a hollow incandescent body. In the author's opinion, earlier workers who claim to have observed the formation of ozone at high temperatures, have been misled by the production of nitric oxide. By means of a simple de-ozoniser, the author shows that the decomposition of ozone at high temperatures (above 127° C.) is a bimolecular reaction. The alteration of the coefficients of velocity with the temperature may be represented by the equation: $\ln k = -\frac{5700}{T} + 14.939$. It follows, from this equation, that ozone decomposes practically instantaneously at 1,000° C., the proportion of ozone diminishing from 1 to 0.001 per cent. in 0.0067 second.—A. S.

Sodium Chloride; Electrolysis of — with Iron Mercury Cathodes. W. Kettembeil and C. F. Carrier. *XI. A.*, page 827.

ENGLISH PATENT.

Soda and Caustic Potash, Chlorine and Hydrochloric Acid; Manufacture of — by Electrolysis of Aqueous Solutions. J. Heibling, Fos, France. *Eng. Pat.* 15,212, July 9, 1903.

SEE *Fr. Pat.* 380,807 of 1903; this *J.*, 1903, 1086.—T. F. B.

UNITED STATES PATENTS.

Sulphuric Acid; Apparatus for Making —. H. Hegeler and N. L. Heinz, Lasalle, Ill. *U.S. Pat.* 765,834, July 26, 1904.

THE claim is for "the combination with a main flue provided with a filled section and free open sections before and after the filled section, of a fan in the free section after the filled section and a secondary flue communicating with the main flue before and after the filled section and provided with a fan." Compare *Eng. Pat.* 254 of 1904; and *U.S. Pat.* 752,677, 1904; this *J.*, 1904, 489 and 370.—E. S.

Bromine; Method of Converting — into Bromides and Bromates. H. H. Dow, Assignor to the Dow Chemical Co., Midland, Mich. *U.S. Pat.* 765,417, July 19, 1904.

BROMINE, with a "fresh gas" or fresh air, practically free from carbon dioxide, is brought into contact with an alkaline bicarbonate. Compare *U.S. Pat.* 752,332 of 1904; this *J.*, 1904, 323.—E. S.

Alkaline Carbonates; Removing Carbon Dioxide from —. H. H. Dow, Assignor to the Dow Chemical Co., Midland, Mich. *U.S. Pat.* 765,418, July 19, 1904.

THE alkaline carbonate or its solution is brought into contact with bromine combined with a large proportion of air, or of inert "fresh gas," and then the air or gas is discharged from the apparatus into the atmosphere. Compare the preceding abstract.—E. S.

FRENCH PATENTS.

Arsenious Gases [Sulphur Dioxide]; Purification of —. Badische Anilin und Soda Fabrik. *Fr. Pat.* 338,817, Nov. 28, 1903.

SEE *Eng. Pat.* 11,549 of 1903; this *J.*, 1904, 659.—T. F. B.

Glover Tower Process; Impt. in the —. H. Hegeler and N. L. Heinz. *Fr. Pat.* 341,257, Feb. 2, 1904.

SEE *U.S. Pat.* 765,834 of 1904, preceding these.—T. F. B.

Nitric Acid; Manufacture of — by Means of Atmospheric Air. Soc. Chem. Fabr. Gladbeck G. m. b. H. Fr. Pat. 341,109, March 10, 1904.

Air, or a mixture of air with an oxide of nitrogen, is heated to a very high temperature, and is then quickly cooled to a temperature as low as possible.—E. S.

Barium Oxide; Preparation of Porous —. Siemens Brothers and Co. Fr. Pat. 341,200, March 12, 1904.

A mixture of barium carbonate with barium nitrate, and preferably with carbon or its equivalent, is heated in an electric or other furnace to obtain porous barium oxide. The materials may advantageously be taken in the proportions indicated by the equation: $\text{BaCO}_3 + \text{Ba(NO}_3)_2 + 2\text{C} = 2\text{BaO} + 2\text{NO}_2 + 3\text{CO}$. If a smaller proportion of the nitrate be taken, a portion of the barium carbonate remains undecomposed, until the temperature has been elevated.—E. S.

Sodium Carbonate; Process and Apparatus for Obtaining — Rapidly, in the State of Small Crystals. Soc. Hofmann and Bro. Fr. Pat. 341,206, March 12, 1904.

A solution of sodium carbonate concentrated at about 30° C. is run into a series of superposed water-jacketed tanks, through which jackets a flow of water is maintained, whilst hollow agitators operated by a revolving vertical hollow axle, passing through the centre of the tanks, are brought into action. Both axle and beaters are provided with a system of water circulation. Above each tank, tubes with widened mouths, inclined downwards, are fixed, for withdrawal of steam. The rapid cooling of the solution thus effected during agitation causes the deposition of small crystals.—E. S.

Fluorspar; Process of Pulverising and Purifying —. G. C. Propfe. Fr. Pat. 338,811, May 4, 1903.

See Eng. Pat. 16,848 of 1903; this J., 1903, 1130.—T. F. B.

Active Oxygen; Salts of Acids containing easily liberated —, Preparation of. G. F. Jaubert. First Addition, dated Feb. 12, 1904, to Fr. Pat. 336,062 of 1903 (this J., 1904, 323).

ACCORDING to the principal patent, salts having the properties named in the title are obtained by reacting on a peroxide by boric or other acid. In the present modified process, the proportion of active oxygen in the salts obtained is increased by causing two acids (such as boric and sulphuric acids) to react on a peroxide. For example: to a mixture of 525 grms. of sulphuric acid with 10 litres of water, 1,240 grms. of boric acid and 780 grms. of sodium peroxide are slowly added. The crystals formed after some hours contain the active oxygen, which may be easily liberated as above described.—E. S.

Phosphates; Purification of —. L. Raymond. Fr. Pat. 340,726, Feb. 27, 1904.

PHOSPHATES, whether calcic or other, are roasted to destroy organic colouring matters, as well as to render insoluble the iron, alumina and silica that may be present; or, if it be desired only to render innocuous the organic matters, the phosphates may be exposed to the action of superheated steam, or be acted upon by a hot or cold concentrated acid.—E. S.

Pyrites; Mechanical Furnaces having superposed Hearths for Roasting —. A. L. Stinville. Fr. Pat. 340,940, March 3, 1904.

In order to better obtain control of the temperature in furnaces such as indicated in the title, a portion of the casing is constructed with a series of vertical passages opening to the air above and below, such passages being separated from the interior heated spaces, and otherwise lined, with conducting metal plates. A current of air passes continually through these passages, or a fluid, as water, may be caused to traverse them, in either case subject to adjustment. Canals may also be made in the hearths for passage of a fluid or of air.—E. S.

Lead Salts; Preparation of —. W. Mills. Fr. Pat. 341,241, March 14, 1904.

See U.S. Pat. 754,668 of 1904; this J., 1904, 371.—T. F. B.

Air and Gaseous Mixtures; Separating — into their Elements. Soc. l'Air Liquide (Soc. Anon. pour l'Etude et l'Exploit. des procédés G. Claude et R. J. Lévy). Fr. Pat. 338,542, June 3, 1903.

THE process for the production of oxygen by means of liquid air or of mixtures of liquid oxygen and nitrogen, consists in bringing these liquids methodically into contact with gaseous oxygen, whereby they become successively enriched in oxygen in substitution for nitrogen, such residual liquid oxygen being finally evaporated in liquefying a corresponding quantity of air. Such an enriching of the liquid mixture may be preceded by application of a gaseous mixture less rich in oxygen. The apparatus consists of a column having a series of superposed platforms, perforated, or with capped openings; a vaporiser in the lower part of the column with an arrangement of tubes whereby the liquid is conveyed from the bottom of the vaporiser, for distribution, to the top of the column, and a portion of the gas formed in the vaporiser passes into the column. Arrangements may be made for the delivery of gas less rich in oxygen into the middle portion of the vertical column. The process and apparatus are claimed as applicable to other gaseous mixtures than of oxygen and nitrogen.

—E. S.

VIII.—GLASS, POTTERY, ENAMELS.

ENGLISH PATENT.

Glass Sheets or Plates; Impts. in, and Apparatus for, the Manufacture of —. E. Fourcault, Lodelinsart, Belgium. Eng. Pat. 28,790, Dec. 31, 1903.

CONTINUOUS sheets of glass are drawn between pairs of asbestos rolls, which permit the sheet being drawn without deterioration, the rolls being composed of superposed asbestos washers, compressed between metal discs, and driven by toothed gearing. Above the rolls is placed a chimney, or casing, for cooling and annealing the sheet; the casing, lined with a non-conducting material, supports the shafts of the rolls, and is provided with gas-jets to re-heat the sheets, and at the top cold air is blown in to accelerate the cooling. Passages for the circulation of water or oil are provided above the drawing slot to cool the glass to the proper consistency for drawing into sheets; also means for throwing jets of cold air on to the sheet to solidify it—and when necessary to cool it more in the middle than at the edges—and gas-jets to re-heat it if necessary. Rails with divergent grooves, or rolls with helical grooves, give a slight stretch to the sheet in a horizontal direction as it leaves the drawing slot. Means are also provided for introducing metal wires into the edges of sheets to avoid contraction as it leaves the drawing slot. The claims also include a portable modification of the apparatus.—W. C. H.

UNITED STATES PATENTS.

Glass-melting Furnace. W. T. Nicholls, Wellsburg, W. Va. U.S. Pat. 764,306, July 5, 1904.

A SERIES of inclined retorts, one above another, each capable of removal without disturbing the others, is arranged in a furnace chamber, through which flame and gases pass. The retorts have feed openings at one end, and at the other discharge openings, containing partitions, by which molten glass is delivered into a working chamber, connected to the side of the furnace chamber.—W. C. H.

Glass; Manufacture of —. S. O. Richardson, jun., Toledo, Ohio. U.S. Pat. 764,501, July 5, 1904.

FRESH material is continuously added to a body of molten glass, confined "in the presence of a reducing temperature," whereby a portion of the molten glass is caused to overflow into a casting zone, which is maintained at a temperature sufficiently high to allow the glass to be cast into definite form by the heat radiated from the reducing zone.—W. C. H.

Ceramic Articles; Process of Manufacturing Reinforced — J. Dansette, Paris. U.S. Pat. 765,858, July 19, 1904.

SEE Eng. Pat. 13,046 of 1903; this J., 1904, 660.—T. F. B.

FRENCH PATENTS.

Ceramic, Porcelain, Enamelled Objects; Production of Coloured Images on — E. Zerr. Fr. Pat. 340,628, Feb. 22, 1904.

COLOURED images are produced on porcelain, enamel, faience, &c., by making three negatives of the original in yellow, red, and blue, and from these three engravings, and by means of these three proofs in oil colours on a sheet; the coloured image is transferred to the object to be ornamented, dusted with coloured powders, and burnt after each transference, or only after applying the powder for all three colours.—W. C. H.

Porcelain or Faience capable of Flowing; Preparation of Paste for — E. Weber. Fr. Pat. 340,664, Feb. 23, 1904.

CERAMIC paste, that will flow, is made by means of plastic clays with the addition of carbonate of soda, soda-lye, ammonia, potash, soluble glass, molasses, soap, &c. The paste is thinned by the addition, besides refractory clay of fine grain, of clays of grain up to 10 mm., for which may be substituted, wholly or in part, quartz, graphite, emery, corundum, &c.—W. C. H.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

Decayed Stone-work in the Chapter House, Westminster Abbey; Treatment of — Copy of Memoranda by A. H. Church. Furnished to the First Commissioner of H.M.'s Works, &c., May 28, 1901.

THE stone affected belongs to an inferior sandstone of one of the lower beds of the Upper Greensand, and consists chiefly of silicious sands with some mica, &c., cemented by from 7 to 15 per cent. of calcium carbonate, and is very subject to injury from exposure to the London atmosphere, whereby in some cases the transformation of the carbonate into gypsum is practically complete. The decay arising from such exposure has occasionally penetrated to a depth of two or more inches, and in many portions, a crust of some thickness peels off on touching with the finger or with a sable brush. Whereas the reaction to test-paper of the watery extract of the unaltered stone is neutral, that of the decayed stone is strongly acid, and contains much soluble salts, due to the action of hydrochloric acid, the ratio of which to sulphuric acid as an attacking agent, comes out only as 1 : 27. Ammonia is sometimes found in the decayed stone. The remedy applied, consisted in repeated treatment of the stone with a saturated aqueous solution of barium hydroxide, by means of a White's pneumatic diffuser, after cleansing the surface from dust by an air jet, applied for instance by a Fletcher foot-blower. The liquid penetrated the decayed stone for the depth of several inches, but did not, until after several successive applications, form an impervious crust on the surface. The hardening proceeded from within outwards, and after, upon an average, about nine successive treatments, the stone became, not only reconstructed, but even harder than when in its original condition. The chemistry of the process consists in the conversion of the gypsum in the decayed stone into barium sulphate, with the simultaneous production of calcium hydroxide, which, gradually absorbing carbon dioxide, reconstitutes calcium carbonate. A slight white film of barium carbonate appears upon the face of the renovated stone, which may be brushed off, or dusted over with raw umber, and allowed to remain as a protective surface.

In a subsequent Report dated Nov. 18, 1903, in continuation of the preceding Report, the author describes the success that had followed the application of the process to the bays of the Chapter House; success was also attained by like treatment of decayed Purbeck marble.

Reference is made to a patent (Eng. Pat. 220 of 1862) for the use of baryta water alternately with a solution of free silicic acid in water, a process which proved efficacious in protecting new stonework, but did not answer well with decayed stonework, owing to the silicic acid clogging the pores of the surface, and so obstructing the baryta solution from penetrating.—E. S.

Cement Roofing Tiles; Testing — Thonind. Zeit., 1904, 28, 999—1000.

A NUMBER of cement roofing tiles supplied by members of the German Cement Ware Association were tested for weight, strength, and porosity. The mean results of 34 samples were as follows:—weight dry, 2·716 kilos.; after 24 hours under water, 2·902 kilos.; breaking strain, 46·7 kilos.; absorption of water, 6·85 per cent. Seven specimens allowed water to penetrate right through.—C. S.

Carbon Dioxide; Determination of — in Crude Cement Powder. G. Sander. XXIII., page 838.

ENGLISH PATENTS.

Emery and like Substances from Slag; Process for Obtaining a Substitute for — L. Wirtz, London. Eng. Pat. 14,366, June 27, 1903.

EMERY, or like substances, and cleaning powders, are obtained by soaking slag in hydrochloric acid or a chloride, and evaporating the resulting liquid, with or without the addition of sodium chloride or other sodium compounds, until it attains a thick consistency. The precipitate formed on cooling is calcined, and washed to remove the heavier crystals of emery from the residue, which is dried and ground.—W. C. H.

Grinding, Polishing, or Smoothing Substance, or a Substance Refractory to Heat; [Electric] Process of Making — J. Windholz, Paris. Eng. Pat. 8659, April 18, 1904.

THE substance described consists of an intimate mixture of carbide of boron, and corundum. The carbide of boron is obtained by melting a mixture of one or more boron compounds and alumina, glucina, and coal in a bath in an electric furnace, the bath consisting of silicate or quartz, iron ore, borate of calcium, and common salt.—W. C. H.

Fireproof Stone or Stoneware and Mortar; Manufacture of — H. Spatz, Düsseldorf, Germany. Eng. Pat. 7786, March 31, 1904.

FINELY divided quartz or other suitable silicious material is combined with a calcareous binding medium, adapted to form silicate of lime, the medium consisting of caustic lime and waste liquor obtained from the manufacture of wood cellulose. This medium may also be used as a fireproof lime-mortar. Fireproof stones may also be produced by moulding and pressing a mixture of wood-cellulose lye and finely divided magnesite, or other highly basic mineral.

—W. C. H.

Slabs or Sheets Imitating Marble; Manufacture of — O. Devillers, Jumet, Belgium. Eng. Pat. 10,040, May 2, 1904.

FRAGMENTS of burst glass bubbles, blown from refined glass of various colours, are spread on glass plates, and sprinkled with powdered or liquid enamel, with or without the addition of sand, and the whole fired at a temperature of about 800° C., and afterwards gradually cooled.—W. C. H.

Wall Paper [Rendering Adhesive]. A. J. Boulton, London. From the Fabrik Gebrauchsartiger Holz- u. Marmor-Imitationen. Fr. Schwartz & Co., Berlin. Eng. Pat. 9487, April 25, 1904.

THE invention relates especially to papers on which are printed coloured representations of wood or marble graining, or the like, and to the method of attaching the same to walls or other surfaces. The back of the paper is coated with a mixture of dextrin and a substance capable of forming with sodium silicate an insoluble double silicate, e.g., an alkaline earth, metallic oxide, &c. The surface to

which the paper is to be applied is first oiled or varnished, and is then coated with "water-glass." The paper is then attached while the "water-glass" is still moist.—E. B.

Cement for use in repairing Retorts, and for like purposes; Manufacture of — J. E. Williams, Manchester. Eng. Pat. 18,064, August 21, 1903.

A FIREPROOF cement composed of the following ingredients in approximately the proportions mentioned:—25 per cent. of magnesite, and 75 per cent. of a mixture of 200 cwt. of (china clay, 100 cwt. of barytes, 40 gallons of silicate of soda (100° Twaddell), 24 gallons of water, and 28 lb. of borax.—W. C. H.

UNITED STATES PATENTS.

Magnesia-Cement Composition. H. Mielck, New York, Assignor to J. L. Sackman, Brooklyn, N.Y. U.S. Pat. 764,250, July 5, 1904.

A COMPOSITION for use as artificial stone composed of a mixture, in which reaction has taken place, of 100 parts of burnt magnesia, 35 parts of magnesium chloride, 5 parts of slaked lime, 5 parts of the residue from ammonia-soda manufacture, 25 parts of clay, and 1,000 to 1,200 parts of sand.—W. C. H.

Cement or Cementitious Material; Making Products of — W. E. Jaques, Grand Rapids, Mich. U.S. Pat. 764,361, July 5, 1904.

THE cement or artificial stone is made by mixing sand, or the like, with a cementing substance in the dry state, moulding the mixture, and subjecting it to pressure, at the same time introducing and impregnating the mass with moisture and finally compacting the moistened mass by external pressure.—W. C. H.

FRENCH PATENTS.

Protective and Insulating Coating for Wood and Metals. L. L. Bébisy and Soc. Myrthil Rose et Cie. Fr. Pat. 340,622, Feb. 22, 1904.

THE coating consists of nitro-cellulose, and a solution of calcium chloride, dissolved in amyl acetate, together with ether, and alcohol, and a powder such as alum, tale, fibrous asbestos, or mica. To render the coating pliant, vaseline oil and oil of aspic may be added. The coating is applied in the liquid state to wood and metals, and is said to make the surface resistant to moisture, flame, corrosion, and to the electric current.—W. C. H.

Paving [from Asphalt]; Process for Making an Artificial — Soc. des Usines Westdeuts. Thomas-phosphat. Fr. Pat. 341,272, March 3, 1904. Under Internat. Conv., Feb. 8, 1904.

SEE Eng. Pat. 7843 of 1904; this J., 1904, 750.—T. F. B.

Porous Bodies [Refractory]; Production of — Cie. Française de l'Acétylène Dissous. Fr. Pat. 341,329, March 14, 1904.

IN order to prepare porous bodies capable of resisting high temperatures, the main constituent, such as magnesia, thoria, baryta, chalk, &c., is mixed with carbon, and with an oxidising substance, such as nitrate or chlorate of the main constituent metal, and the mixture is strongly heated. The carbon is thus burnt away, not only by the action of external air, but also by that of oxygen internally evolved, so that a body porous throughout is produced. If a saline nitrate or chlorate, such as sodium or potassium nitrate or chlorate for instance, is used, the soluble carbonate remaining after the furnacing, may be washed out of the product by water.—E. S.

Lime and Cement Furnaces; Impts. in —, to Increase the Draught, and Carry Off the Fumes from the Furnace Mouth. Cie. des Fours à Chaux de la Gare de Beffes (Cher). Fr. Pat. 340,461, Feb. 15, 1904.

To increase the draught of lime and other furnaces, an inverted truncated cone of metal is arranged at the bottom

of the chamber and perforated with orifices to allow external air to enter the chamber and become heated. In the upper part of the furnace, a little below the top, is arranged a circular channel, which communicates through openings with the interior of the combustion chamber, to draw off fumes and gases from the chamber and convey them to the chimney.—W. C. H.

Cement; Manufacture of — K. Müller. Fr. Pat. 340,479, Feb. 16, 1904.

CEMENT is made by mixing sulphate of lime with barium chloride, with the addition of a base, suitable for the formation of oxychloride, such as the oxide of calcium, magnesium, or lead.—W. C. H.

Cement and Similar Substances; Process for Preparing and Burning — Levie Frères. Fr. Pat. 341,211, March 12, 1904. Under Internat. Conv., March 30, 1903.

SEE Eng. Pat. 7028 of 1904; this J., 1904, 607.—T. F. B.

X.—METALLURGY.

Monell [Steel] Process. Leo. Oesterr.-Z. Berg.-u. Hüttenw., 1904, 52, 355. Chem.-Zeit., 1904, 28, Rep. 215.

THIS process is a modification of the Martin process. A charge consisting of 3 tons of limestone, and 1—1.2 tons of iron ore is placed on the magnesite hearth, and after 1½ hours, when the ore is nearly fused, 40 tons of molten pig-iron direct from the blast furnace are added. A vigorous reaction takes place, phosphorus, silicon, and manganese going rapidly into the slag, which after about two hours is almost completely run off through an outlet at the back of the furnace. The steel now has the following composition (A):—

	Pig Iron.	Ore.	Steel (A).	Steel (B).
	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Carbon	3.90	..	2.0—2.5	0.25—0.30
Silicon	0.5—0.9	3.0	trace	..
Manganese	0.8—0.9	0.1	0.1—0.15	0.38—0.40
Phosphorus	0.5—0.8	0.1	0.04	0.015—0.016
Sulphur	0.04—0.07	..	0.04	0.024
Iron .....	..	64.0	..	..

140—180 kilos. of ore are then added, and the bath of metal, almost entirely free from slag, is heated further until the desired degree of decarburisation is attained (see col. B in table). The slag contains silicic acid, 20; iron, 20—25; phosphoric acid, 3—5; lime, 20—25.—A. S.

Steel Rails; Effects of Annealing on — T. Andrews and C. R. Andrews. Proc. Inst. Civil Eng., 1904, 156, [2].

FOLLOWING a suggestion made in 1900 by W. C. Roberts-Austen and T. E. Thorpe, the authors have determined the effect of annealing finished steel rails at temperatures of 770°, 850°, and 940° C. The results indicate that no great practical advantage would accrue from the general annealing of finished steel rails, although in some special cases it might be useful. If careful attention be paid to the physical composition of the finished rails, and to their thermal treatment during manipulation, good rails can be obtained from both acid-Bessemer and acid-Siemens steel, provided that the chemical composition be kept within the following limits or near thereto: combined carbon, 0.390—0.411; manganese, 0.697—0.775; silicon, 0.058—0.065; sulphur, 0.066—0.076; and phosphorus, 0.063—0.066 per cent. The detailed results obtained are set out in a series of tables, and four micro-photographs are given showing the difference in structure before and after annealing.—A. S.

Gold and Silver Extraction; Refining of the Precipitates Obtained by Means of Zinc in the Cyanide Process of — G. H. Cleveuger. Trans. Amer. Inst. Min. Eng., Oct. 1903.

THE author considers that the best method of refining the gold-silver-zinc precipitates from cyanide solutions is by

smelting with lead after distilling off the zinc. He prefers this to the ordinary acid treatment, since most of the zinc is thus at once recovered in a form available for re-use as a precipitant. The process recommended is to mix the dried precipitate with granulated lead (one to three times the weight of the dried precipitate) and charcoal (about one-tenth the weight of the lead). The mixture is placed in a graphite retort, which is heated by means of a gas furnace. The greater part of any mercury that may be present is driven off while the temperature is still very low, and may be readily collected. On further heating, zinc begins to distil off at about 700° F., and practically all is driven off in four or five hours, the temperature being finally raised to 1300° F. Very little gold or silver is thus volatilised, and that little remains with the zinc, which is used for subsequent cyanide precipitation. When the metallic vapours are received in a well-cooled condenser most of the zinc condenses as dust, especially while carbon monoxide is being evolved. The material in the retort at the end of the distillation is in appearance the same as at the start; but upon closer examination there will be found small shots of bullion all through it, and, usually, one or two larger masses. This residue can be poured from the retort like so much sand. It should be mixed with four or five parts of litharge and melted down on a test, a little iron filings and silica being added when necessary. After thorough fusion the slag is skimmed off and the lead cupelled, the resulting litharge being used for the next operation. The bullion after re-melting is cast into bars which are ready for parting.—J. H. C.

Aluminium Wire for Electrical Transmission; Application of — F. Krull. *Z. angew. Chem.*, 1904, 17, 1058—1060.

THE author gives a list of nine large power transmission lines in the United States, Canada, and Italy, which have used, and still use, aluminium instead of copper wire. Aluminium wire installations are not yet to be found in Germany and England, except in the case of factories where aluminium is made. Reference is made to the work of J. B. C. Kershaw, according to which the corrosion of exposed aluminium wires at St. Helens and Waterloo (Liverpool) is considerable, and sufficient to make the use of aluminium unsuitable for transmission purposes in those districts.—R. S. H.

Aluminium-Tin Alloys. E. S. Shepherd. *J. of Phys. Chem.*, 1904, 8, 233–247. *Chem. Centr.*, 1904, 2, 181.

THE author first discusses the work of Guillet (this J., 1902, 121) and of Anderson and Lean (this J., 1903, 1245), and then gives the results of his own experiments, which consisted in determining the cooling curves and densities of various mixtures of aluminium and tin. The cooling curves and examination of the microstructure gave no indication of either of the alloys, AlSn and Al₃Sn. Also, no proof could be discovered of the existence of two layers in the mixtures, but the presence of a solid solution (containing about 20 per cent. of tin) was ascertained. The densities of the products were as follows:—

Percentage of Aluminium.	Density.	Percentage of Aluminium.	Density.
100	2.693	50	3.829
95	2.780	40	4.199
90	2.845	30	4.671
80	3.001	20	5.308
70	3.211	10	6.176
60	3.489	5	6.679

—A. S.

Lead Assay; Commercial Wet — H. A. Guess. *XXIII.*, page 838.

ENGLISH PATENTS.

Furnaces for Roasting Ores and like Materials; Working and Construction of — W. Kauffmann, Kalk, Germany. Eng. Pat. 1013, Jan. 15, 1904.

SEE Fr. Pat. 334,528 of 1903; this J., 1904, 67.—T. F. B.

Calcareous Ores [chiefly of Zinc]; Enriching — E. Leduc, Gagny, and C. Griffiths, Pierrefitte, France. Eng. Pat. 12,797, June 6, 1901.

CALCAREOUS ores, and especially poor calamine ores, are calcined, the carbon dioxide evolved is stored, and the residue, after being slacked in heaps, and powdered if necessary, is agitated with a solution of sugar, whereby the lime is dissolved. The residue, after washing and drying, constitutes the enriched ore. The solution of calcium saccharate is decomposed by the carbon dioxide, previously collected, to recover the sugar solution for re-use.—E. S.

Quicksilver [Mercury] Ores; Furnace for Calcining — J. M. Cutler, Ukiah, Cal., U.S.A. Eng. Pat. 12,976, June 8, 1904. Under Internat. Conv., June 10, 1903.

SEE U.S. Pat. 740,539 of 1903; this J., 1903, 1197.—T. F. B.

UNITED STATES PATENTS.

Case-hardening; Process of — C. Lamargese, Rome. U.S. Pat. 765,706, July 26, 1904.

SEE Fr. Pat. 333,076 of 1903; this J., 1903, 1297.—T. F. B.

Steel; Treating Scrap —, and **Recarburising same.** H. B. Atha, East Orange, N.J. U.S. Pats. 765,724 and 766,131, July 26, 1904.

SEE Eng. Pat. 2187 of 1904; this J., 1904, 609.—T. F. B.

Steel, Cast; Manufacture of — M. Meslans, Paris. U.S. Pat. 765,932, July 26, 1904.

SEE Eng. Pat. 14,693 of 1902; this J., 1903, 96.—T. F. B.

Filtering Process [for Slimes]. G. Moore, Salt Lake City, Utah. U.S. Pat. 764,486, July 5, 1904.

A CLOSED perforated box covered with cloth or other medium is immersed in the "slimes" or other material to be filtered. A vacuum is then produced in the box, and the liquid drawn through, leaving a deposit on the outer surface. The filter is then removed to another tank containing water, the suction being maintained, and the water is drawn through to wash the deposit. The box is then lifted out, and the deposit removed by forcing a current of air or water from within outwards. The filtering medium may then be washed in another tank, and the process repeated. —W. H. C.

Crucible Furnace. C. W. Spiers, Assignor to Morgan Crucible Company, Ltd., London. U.S. Pat. 765,299, July 19, 1904.

SEE Fr. Pat. 337,802 of 1903; this J., 1904, 548.—T. F. B.

Ore-Roasting Furnace. G. H. Shellabarger, Dekalb, Ill., Assignor to Apex Manufacturing Company, Kansas City, Mo. U.S. Pat. 765,997, July 26, 1904.

THE furnace is of the long horizontal revolving type, and has a central primary ore chamber, with passages communicating between it and numerous separate return ore chambers, with interspaced longitudinal heat passages. An annular "air-trunk" surrounds and encloses the primary ore chamber. A heat-generating furnace, through the combustion chamber of which the body of the ore furnace extends, and beyond which the receiving end of the furnace body projects, communicates with the several return ore chambers. Means are provided for feeding ore into the receiving end of the primary ore chamber, and into the contiguous end of the annular air-trunk. The ore chambers are sealed against the admission of products of combustion. A fume chamber and hopper communicate with the discharge ends of the return ore chambers. A series of valved air-pipes lead from the annular air-trunk into each of the return ore chambers. There is a closed receptacle for introducing a granular refining agent, mounted upon the exterior of the revolving furnace body, having an outlet pipe communicating with the interior of the roasting chamber, controlled by a valve, with which a weighted arm is connected, whereby the valve is caused to rotate upon its own axis as the furnace revolves, and alternately opens and closes by gravity.—E. S.

Ore-Roasting Furnace. G. H. Shellabarger, Dekalb, Ill., Assignor to Apex Manufacturing Company, Kansas City, Mo. U.S. Pat. 765,999, July 26, 1904.

THE furnace, as to its general features, belongs to the type of that described in the preceding abstract. A number of body sections are joined end to end to form an extended horizontal revolving furnace. There is a central "air-trunk" with a number of concentric air-chambers, a corresponding series of interspaced heat flues, and radial air-flues affording communication between the air-trunk and ore chambers at intervals throughout the length of the furnace. The radial air-flues are controlled by hollow piston valves operated by rods. Means for feeding and discharging the ore are described.—E. S.

Alloy, and Method of its Manufacture. R. B. Wheatley, London. U.S. Pat. 766,085, July 26, 1904.

To about 160 parts of molten zinc, 8 parts of strontium sulphate are added; second, to about 640 parts of copper and 240 parts of molten zinc, 8 parts of an alloy of 6 parts of copper to 2 parts of manganese, 4 parts of an alloy of 1 part of iron to 3 parts of tungsten, 3 parts of aluminium and 4 parts of tin are added; third, the product of the first mixing is added to that of the second mixing while the latter is in the molten state. An alloy is also claimed consisting of about 98.5 parts of an alloy of 60 parts of copper with 40 parts of zinc, to which is added about 1.5 parts in all of stated proportions of iron, tungsten, aluminium, tin, and strontium.—E. S.

Spelter; Process of Making —. O. Nagel, Hamborn, Germany. U.S. Pat. 766,279, Aug. 2, 1904.

SEE Fr. Pat. 322,253 of 1902; this J., 1902, 303.—T. F. B.

FRENCH PATENTS.

Ferruginous Ores; Treating — for the Manufacture of Iron and Steel. M. Moore and T. J. Heskett. Fr. Pat. 341,169, March 4, 1904.

FERRUGINOUS sand or crushed iron ore is fed into the top of a tower, furnished inside with a series of baffling passages inclined in opposite directions, and having one part superposed vertically upon the other. The upper part, the heating chamber, receives reduced gases from the lower part, and has inlets for air, at its base; the lower part is the reducing chamber, the heated ore passing into which is met by a current of carbon dioxide or of a gaseous hydrocarbon. The tower communicates at its bottom with a Siemens or other melting furnace, into which the reduced ore is delivered without contact with air. The tower, instead of being vertical, may consist of two rotating cylinders set at a slight angle to the horizontal, and communicating by a vertical passage, suitable arrangements being made for feeding the ore, and for discharging it when reduced into the furnace on a lower level.—E. S.

Aluminium and all Alloys containing it; Process for Soldering and Brazing —. L. Trezel and A. J. de Monthy. Fr. Pat. 341,186, Feb. 9, 1904.

SEE Eng. Pat. 4973 of 1904; this J., 1904, 492.—T. F. B.

Melting Furnace. H. J. J. Charlier. Fr. Pat. 340,625, Feb. 22, 1904.

THE furnace is mounted on trunnions to be capable of turning on its longitudinal axis; it has an axial opening at one end to admit a combined gas and air jet, and an opening on the top, near the end receiving the flame, for insertion of a removable charging hopper. Thus, the products of combustion pervade the interior of the furnace, and coursing back from the closed end, find exit through the charging hopper. The same opening that admits the hopper, on removal of the latter, serves, after tilting the furnace, as the discharging opening for the molten contents.—E. S.

Brazing Composition and its Application. J. C. Bassett, T. E. Parker, and H. F. Strout. Fr. Pat. 340,180, March 8, 1904.

SEE U.S. Pat. 756,079 of 1904; this J., 1904, 444.—T. F. B.

Zinc; Extraction of — [Free from Lead]. C. S. Brand. Fr. Pat. 341,345, March 15, 1904.

IN the distillation of zinc in the usual retorts, a mass of refractory bodies, such as fragments of earthen crucibles, is placed within the tubulures of condensation at the ends adapted to the retort, or within the retorts themselves near their outlets, in order to arrest by filtration the lead accompanying the zinc-vapour.—E. S.

Zinc; Extraction of — [Free from Lead]. C. S. Brand. Fr. Pat. 341,346, March 15, 1904.

IN order to remove lead from the vapour of zinc in the ordinary process of distillation, the tubulure to the retort is formed with a closed perforated end, from the bottom of which the under side rises upwards at an acute angle so as to approach the level top of the tubulure, forming a bridge, beyond which the lower side is curved downwards, to form a basin wherein the distilled zinc collects. The lead present in the vapours is arrested by the pocket formed by the bridge and end of the tubulure, as described, and, condensing there, flows back through an orifice in the end into the retort. Compare the preceding abstract.—E. S.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(A.)—ELECTRO-CHEMISTRY.

Sodium Chloride; Electrolysis of — with Iron-Mercury Cathodes. W. Kettembeil and C. F. Carrier. Z. Elektrochem., 1904, 10, 561—566.

THE authors have examined a recently patented process (Gurwitsch, Ger. Pat. 145,749 of 1902), in which the cathode consists in a slanting plate of corrugated iron on which is dropped mercury, which then covers the whole plate. These cathodes are useless when they begin to rust, and must be constantly kept under current. The best possible yield of alkali is obtained at a current density of not less than 0.38 ampère per sq. cm., with a somewhat rapid flow of mercury, the anode being separated by a porous septum; the current efficiency is then about 85 per cent. The losses are attributed mainly to eddies set up by the mercury, whereby chlorine is continually brought into contact with the amalgam. Nickel presents no advantages as a cathode material. One of the authors (Carrier) subsequently shows that a good yield, without using a diaphragm, can only be obtained if the surface of the mercury be kept either in a condition of slow and even motion or in one of entire rest.

—W. A. C.

Bismuth; Electrolytic Determination of —. A. Holiard and L. Bertiaux. XXIII., page 839.

Manganese; Electrolytic Determination of —. J. Koster. XXIII., page 839.

ENGLISH PATENTS.

Sealing Metal into Glass or other Vitreous Material [Wires for Incandescent Lamps, &c.]; **Methods of** —. E. A. Carolan. From the General Electric Co. Eng. Pat. 18,255, Aug. 24, 1903. II., page 816.

Grinding, Polishing, or Smoothing Substance, or a Substance Refractory to Heat; [Electric] Process of Making —. J. Windholz. Eng. Pat. 8859, April 18, 1904. IX., page 824.

UNITED STATES PATENTS.

Gases [Batteries]; Method of Separating Mechanically-entrained Globules from —. T. A. Edison, Llewellyn Park, N.J., Assignor to Edison Storage Battery Co., Orange, N.J. U.S. Pat. 764,183, July 5, 1904.

THE mechanically-entrained globules are separated from the gases generated in a storage battery, and the gases are rendered non-explosive, by forming a liquid film in the path of the escaping gases. The escape of the gases is prevented until a sufficient pressure is attained, and, by suddenly releasing the pressure, the gases and entrained globules are

projected against the film with sufficient velocity to overcome the surface tension of the film, whereby the entrained globules coalesce with the film. Simultaneously with the escape of the gases, the surplus quantity of the film not retained by capillarity is returned to the solution. The gases escape through a contracted vent and are spread, diffused and attenuated, the attenuated gases finally passing through a cooling medium.—B. N.

Electrical Energy; Method of Converting the Energy of Fuel into —. H. Jone, Chicago. U.S. Pat. 764,593, July 12, 1904.

A METAL, such as tin, which is capable of forming a higher and lower oxide, is used as the positive plate in a solution of an alkali as the electrolyte, the negative plate consisting of a porous carbon vessel, the latter serving also as a container for a metallic oxide acting as a depolariser. The metal is oxidised, and the tin remains in solution in the alkali, and is afterwards precipitated as barium stannite by addition of barium hydroxide. The barium stannite is reduced to metallic tin by means of carbonaceous fuel, and the waste gases from the furnace are used to heat the galvanic cell.—B. N.

Smelting Compounds and Producing Carbides [Electrical]. W. S. Horry, Assignor to Union Carbide Co., Niagara Falls, N.Y. U.S. Pat. 765,838, July 26, 1904.

ELECTROLYSABLE compounds, with or without mixture with a reducing agent, are smelted by subjection to an alternating electric current, having a frequency of more than 133 periods per second. Calcium carbide is produced by heating in like manner, and under the same conditions as to frequency of alternations of the current, a mixture of a calcium compound with carbon. In any case the frequency of the alternations of the current should be such as to "substantially eliminate losses due to electrolytic decomposition," the energy of the current being thus made available as heat.—E. S.

Water; [Electrical] Method of Purifying —. W. M. Jewell and W. J. McGee. U.S. Pat. 766,146, July 26, 1904. XVIII. B., page 833.

FRENCH PATENTS.

Electric Energy direct from Coal; Process and Apparatus for Producing —. H. J. Keyzer. Fr. Pat. 341,144, Feb. 16, 1904.

SEE Eng. Pat. 3913 of 1904; this J., 1904, 611.—T. F. B.

Protective and Insulating Coating for Wood and Metals. L. L. Béthisy and Soc. Myrtil, Rose et Cie. Fr. Pat. 340,622, Feb. 22, 1904. IX., page 825.

Carbides; Apparatus [Electric Furnace] for Making —. LeRoy W. Stevens and B. Timmerman. Fr. Pat. 341,125, Jan. 12, 1904.

SEE U.S. Pat. 749,461 of 1904; this J., 1904, 192.—T. F. B.

Barium Oxide; [Electrical] Preparation of Porous —. Siemens Bros. and Co. Fr. Pat. 341,200, March 12, 1904. VII., page 823.

(B).—ELECTRO-METALLURGY.

Sodium; Electrolytic Production of — from Mixtures of Sodium Hydroxide and Carbonate. C. F. Carrier. Z. Elektrochem., 1904, 10, 568–572.

In discussing Becker's process (Ger. Pat. 104,955) the author points out that the addition of carbonate to the fused electrolyte can be of little use unless the carbonate itself is directly split up with evolution of carbon dioxide. Experiments were made with mixtures of caustic soda and sodium carbonate containing up to 66 per cent. of the latter, at temperatures of 230° to 430° C. and current-densities rising to 2½ ampères per sq. cm. In no case was an evolution of carbon dioxide detected. It is concluded that Becker's process is no advance upon Castner's, in which fused caustic soda alone is electrolysed.—W. A. C.

UNITED STATES PATENT.

Nickel-Plating; Process of —. J. W. Aylsworth, Assignor to Edison Storage Battery Co., Orange, N.J. U.S. Pat. 765,371, July 19, 1904.

The strip-like article, or a connected series of separate articles, is passed continuously through a heating chamber in which the articles are heated, and surrounded by a reducing atmosphere in order to deoxidise them. They are then passed continuously through a plating bath, washed, and finally subjected to a welding temperature, produced electrically, and cooled while surrounded by a non-oxidising atmosphere.—B. N.

FRENCH PATENTS.

Furnace; Electric —. E. F. Côte and P. R. Pierron. Fr. Pat. 340,632, Feb. 22, 1904.

VOLATILE metals, such as zinc, are extracted from their ores by displacing the metal with a second, such as iron. The mineral and reacting metal are melted separately in two crucibles by electric arcs, and the melted substances then flow into a closed chamber, in which they are mixed and maintained in a fluid state, during the reaction, by the Joule effect.—B. N.

Heating of Carbon [Electrically]; Process of —, Applicable in Chemical and Other Analogous Processes. Soc. Auon. L'Ind. Verrière et ses Dérivés. Fr. Pat. 340,846, March 1, 1904.

THE carbon is heated by the resistance which it offers to the passage of an electric current. Forms of apparatus are described in which the method is applied to the manufacture of carbon bisulphide and the cementation of iron.

—B. N.

XII.—FATTY OILS, FATS, WAXES, AND SOAP.

Bees-wax of British India. D. Hooper. Indian Agric. Ledger, 1904, 73–110.

AFTER describing the species of bees found in India, the centres of the wax and honey trade are discussed, the methods of preparing the wax and its local uses are referred to, and finally the character and chemical composition of the various kinds of bees-wax are given. Indian bees-wax is derived from three species of bees, *Apis dorsata*, *A. indica*, and *A. florea*, but chiefly from *A. dorsata*. In the following table the chemical and physical characteristics of these waxes are shown:—

Origin.	---	Melting Point.	Acid Value.	Saponification Value.	Hübl Iodine Value.
<i>Apis dorsata</i> , 23 samples	Average	63°1	7·0	96·2	6·7
	Maximum	67°0	10·2	103·0	9·9
	Minimum	60°0	4·4	78·6	6·8
<i>Apis indica</i> , 7 samples	Average	63°25	6·8	96·2	7·4
	Maximum	64°0	8·8	102·5	9·2
	Minimum	62°0	5·0	90·0	5·3
<i>Apis florea</i> , 5 samples	Average	61°2	7·5	103·2	8·0
	Maximum	63°0	8·9	130·5	11·4
	Minimum	63°0	6·1	88·5	6·6

It will be seen that, whilst the waxes are almost identical in composition, they differ considerably from European waxes. The acid value is much lower, and the usual ratio of cerotic acid to myricin is consequently altered.

Another source of wax in India is from the Dammar bees, *Melipona (Trigona) spp.*, a species also occurring in South America. This wax has an average melting-point of 70·5° C., acid value 20·8, saponification value 110·4, and iodine value (Hübl) 42·2.—W. P. S.

Unsaponifiable Matter in Oils and Fats [Determination of] —. J. Huwart. XXIII., page 841.

Halogen Absorption of Oils; Comparison of the Hübl, Wijs, Hanus, and McIlhenny Methods of Determining the —. L. M. Tolman. XXIII., page 841.

Lard from Hogs fed on Cottonseed Meal; Reaction of — with Halphen's Reagent. E. Fulmer. XVIII. A., page 832.

Glycerides; Solutions of — in Acetic Acid. L. Hoton. XXIII., page 840.

Beeswax; Detection of Artificial Colouring Matter in —. P. Lemaire. XXIII., page 840.

Glycerol; Notes on the Determination of — [Bichromate Method]. Taurel. XXIII., page 841.

ENGLISH PATENTS.

Fish, Fish Refuse, and the like; Treatment of —. W. M. Sandison. Eng. Pat. 15,319, July 10, 1903. XV., page 831.

Cod-liver Oil; Manufacture of a Substitute for —. K. F. Töllner. Eng. Pat. 2081, Jan. 27, 1904. XX., page 836.

Phonographic Cylinders, &c.; [Celluloid-Stearin] Composition for the Manufacture of —. A. Defavrie. Eng. Pat. 19,163, Sept. 5, 1903. XIX., page 834.

FRENCH PATENTS.

Oil Press. Soc. A. Pifre et Cie. Fr. Pat. 340,565, Feb. 19, 1904. *

THE body of the press consists of two symmetrical parts held together by bands and enclosing a hollow space within which are packed the layers of material. The pressure is effected by the head of a piston which rises into the central space, and in which outlets are provided for the escape of the oil.—C. A. M.

Filtering Material for Fats and Oils. G. Gautier. Fr. Pat. 341,167, March 3, 1904. ✓

THE material consists of dry powdered skins or hides, especially the artificial leather made as described in Fr. Pat. 310,726 of 1901. (See Eng. Pat. 19,249 of 1901; this J., 1902, 1405.)—W. P. S.

Fatty Substances from Moist Materials; Extraction of —. F. Frank. Fr. Pat. 341,344, March 15, 1904. ✓

THIS is a process for extracting oils, fats, or waxes from moist raw materials such as peat, fruits, oily effluents, &c., containing much water. For this purpose the material is placed in a cylindrical vessel and treated in its moist condition with vapour of benzene, carbon bisulphide, alcohol, acetone, chloroform, ether, or like solvent. The top of the cylinder is attached to a condenser, whereby the escaping vapours of the solvent, together with water vapour, are collected and separated. That part of the solvent which condenses in the cylinder is drawn off and evaporated to obtain the residue of oil, fat, or wax.

—W. P. S.

Soap for Use by Lead Workers; Manufacture of —. Chem. Werke G. m. b. H. vorm. C. Zerbe. Fr. Pat. 341,159, Feb. 25, 1904. ✓

A SOLUTION of soap is mixed at a temperature of 30° C. with powdered alkali sulphides, and allowed to cool. Powdered marble may be added to form a more solid soap. In use, the sulphides convert any lead on the hands into insoluble lead sulphide. The soap will also prevent similar poisoning by copper or mercury.—W. P. S.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(A).—PIGMENTS, PAINTS.

Zinc White and White Lead; Relative Covering Power of —. E. Lenoble. Bull. Soc. d'Encouragement, 1904, 106, 513–537.

THE expression "covering power," as applied to a pigment, has been understood in two different senses, viz., power of extension over a larger or smaller area, and power of con-

cealing the subjacent surface. The author considers the latter to be the true meaning of the expression, since the former can obviously be varied for the same pigment by altering the proportion of vehicle with which it is mixed. Covering power is therefore directly related to opacity. As the result of numerous comparisons it is found that when white lead (Dutch) and zinc white (Vieille Montagne) are mixed with equal proportions of vehicle (oil and turpentine), 7 parts by weight of white lead are required to give the same degree of opacity as 5 parts of zinc white, or 7 volumes of white lead as 6 volumes of zinc white. Therefore, whether equal weights or equal volumes are regarded, zinc white has the greater covering power. In practice, however, zinc white requires a much larger proportion of vehicle than white lead. As a consequence, it results that when coats of equal thickness of the two paints are laid on (containing those proportions of vehicle which render them applicable with equal facility), it is necessary to apply four coats of the zinc white paint to obtain the same opacity as that produced by three coats of white lead.

—M. J. S.

UNITED STATES PATENTS.

White Lead; Treating the Residue resulting from Manufacture of —. J. W. Bailey, F. T. Bailey, and M. Bailey, New York, Assignors to the United Lead Co., New Jersey, U.S.A. U.S. Pat. 766,133, July 26, 1904.

THE waste products from the corroding process, consisting of lead carbonate, lead oxide, and metallic lead, are fed into a revolving drum arranged obliquely. The lower part of the drum contains acetic acid, the upper part air and corroding gas. The mixture is therefore alternately submerged in the acid and exposed to the air, whilst the attrition of the metallic particles constantly presents new surfaces to the action. With a suitable strength of acetic acid, the metallic lead and lead oxide are converted into lead acetate, which remains in solution, whilst the lead carbonate is automatically discharged from the drum.—M. J. S.

Paints and Paint Vehicles; Production of —. E. H. Strange and E. Graham, London. U.S. Pat. 766,740, Aug. 2, 1904.

SEE Eng. Pat. 8335 of 1903; this J., 1904, 448.—T. F. B.

(B).—RESINS, VARNISHES.

ENGLISH PATENT.

Oilcloth or Linoleum; Substitute for —. W. Melville, W. V. Rees, and P. L. Rees, Manchester. Eng. Pat. 12,663, June 4, 1904.

SHEETS of fibrous paper pulp are hardened and rendered non-absorbent by treatment with oil and size, to which lime or "soda" has been added. When dry the material is coated with oils and staining colours, again dried, and finally printed with the desired pattern.—T. F. B.

UNITED STATES PATENTS.

Distilling Crude [Turpentine] Oils; Apparatus for —. J. C. Mallonee, Charlotte, W.C., Assignor to J. J. Mallonee, Crichton, Ala. U.S. Pat. 764,188, July 5, 1904.

THE apparatus is designed for distilling turpentine from crude turpentine oils, and consists of a still provided with a vertical vapour outlet of sufficient length to permit the heavier oils to flow back to the still, the lighter vapours passing through a condenser to the separator. A pipe fixed in the bottom of the still carries the residue to a second still, which is also connected with a condenser and separator, whence the distillate passes to a third still. The residues from the second and third stills are run together into a fourth still, where they are fractionated.—T. F. B.

Resinous Matter; Process of Extracting — from Long-leaf or Pitch Pine. W. B. D. Penniman, Baltimore, Md. U.S. Pat. 764,863, July 12, 1904.

THE wood is steeped in hot liquid in a suitable vessel, the atmospheric pressure is then reduced above the liquid and the exuded resinous matter is later decanted from the surface of the liquors.—R. L. J.

FRENCH PATENT.

Varnish; Process of Making Quick-drying —
T. Abelmänn. Fr. Pat. 338,807, May 18, 1903.

A RESIN, such as colophony, is melted and incorporated with an equal weight of a mixture of four parts of heavy mineral oil (sp. gr., 0.820–0.890) and one part of petroleum naphtha (benzine lourde) (sp. gr. 0.780–0.740), or with the intermediate petroleum fraction known as solar oil. This product is then oxidised by atmospheric air, diluted to an appropriate fluidity with oil of turpentine, and treated with 1.5–3 per cent. of a siccative.—M. J. S.

(C).—INDIA-RUBBER, &c.

Venezuelan Rubber-Latexes. Markwald and Fr. Frank. Gummi-Zeit., 1904, 18, 850–851.

THREE latexes, one unnamed, of Venezuelan origin were found to have the following composition and characters:—

	1. "Leche de Marina."	2. "Leche de Pendare."	3. Unnamed.
	Per Cent.	Per Cent.	Per Cent.
Rubber substance.....	0.65	2.26	20.54
Resins.....	19.38	17.62	73.52
Albuminous matter...	1.36	0.29	
Impurities.....	1.60	4.80	1.85
Ash.....	0.75	0.01	0.62
Water removed at 100° C.....	76.25	74.74	3.45
Appearance of latex...	Reddish- white acid fluid, pre- served by formalin.	Yellowish acid fluid, somewhat coagulated.	Cheesy appearance.
Nature of rubber.....	Very inferior; no a-caout- chouc present.	Poor; 13.11 per cent. of a-caoutchouc present.	Good; 66.42 per cent. of a-caoutchouc present.
Nature of resin.....	5 per cent. soluble in acetone with m. pt. 62.5°.	18 per cent. of m. pt. 64° C.; 82 per cent. of high m. pt.	Similar to Pontianac resin.

The impurities of No. 2 consisted almost entirely of sugar and the ash of 1 and 2 was chiefly lime and magnesium salts.—R. L. J.

Para Rubber; Decomposition of — by Ozone.

C. Harries. Ber., 1904, 37, 2708–2711.

PARA rubber, in chloroform solution, whilst only polymerised by the action of permanganate, forms an ozonide under the action of ozone. When warmed with water this decomposes into keto- and di-aldehydes and hydrogen peroxide, which last oxidises the aldehydes to the corresponding acids. The ozonide, readily purified by solution in ethyl acetate and precipitation with light petroleum spirit, is a vitreous mass, explodes like other ozonides, when heated on platinum, and has the composition $(C_{10}H_{16}O_8)_x$. Molecular weight determinations made it uncertain whether the value of x should be 2 or 3. On digestion with water for a short time, the solution when tested indicated the presence of levulinic and succinic aldehydes. After complete digestion, the main product was identified as levulinic acid. A smaller product gave reactions characteristic of succinic acid but could not be identified with the known acid. These results indicate the presence of the complex $C > C:CH.CH_2.CH_2.C(CH_2):CH.C$ in the original $C_{10}H_{16}$ molecule. Oxalic acid was not found and is probably only a secondary oxidation product of rubber. Like other ozonides the caoutchouc ozonide is much more highly active to a sensitised plate than ozone itself.—R. L. J.

UNITED STATES PATENT.

Raw Rubber; Apparatus for Treating — J. R. C. Danin, Para, Brazil. U.S. Pat. 765,167, July 19, 1904.

A HOLLOW drying-drum with open ends is fitted with a flattened, "flaring," nozzle inside, which delivers the

products of combustion received by means of a tube from an outside combustion funnel, close up to the wall of the drum.—J. K. B.

FRENCH PATENTS.

Vulcaniser; Improved — Soc. F. Clouth, Rheinische Gummi-Waarenfabrik. Fr. Pat. 340,670, Feb. 23, 1904.

MECHANICAL details are given of an improved vulcaniser, with (a) means for applying mechanical pressure through the top upon the enclosed moulds or forms; and (b) a laterally disposed cover or lid secured by screws, these features being in combination.—R. L. J.

Rubber Substitutes; Manufacture of Substances for use as — The Velvri Co., Ltd. Fr. Pat. 341,407, March 17, 1904.

SEE Eng. Pat. 13,396 of 1903; this J., 1904, 670.—T. F. B.

XIV.—TANNING; LEATHER, GLUE, SIZE.

Chromed Hide-Powder Question. F. Kopecky. Collegium, 1904, 211–214, 217–222.

THE results obtained by the author show that a satisfactory chromed hide-powder may be made from the inferior parts of a hide (belly) which are unsuitable for the manufacture of ordinary hide-powder. As compared with the ordinary powder, e.g., Freiberg, the absorptive power is less per gram, but is regular, whilst the powder can be packed closer, so that the usual filter bell is large enough for all purposes. The quantity required for analysis may be packed dry or wholly or in part moistened with the liquor under analysis without affecting the result. The absorptive power increases as the powder is more finely ground, though for stirring and shaking methods of analysis, a somewhat coarse powder used in larger quantities than 10 grms. per 100 c.c. of liquor (0.35–0.45 per cent. tannin) is desirable. The absorptive power of this powder diminishes as it is more highly chromed, but if underchromed the solubility is greater, and especially for the analysis of acid liquors, which really has caused the demand for an alternative powder, it must be sufficiently chromed to prevent swelling. Chrome alum crystals (10 per cent.) and crystallised sodium carbonate (3.5 per cent.) give a suitable chroming liquor. A basic liquor made from bichromate by reducing with glucose is less satisfactory. As regards neutralisation, this must not be carried too far; if too highly neutralised the powder becomes less absorptive and at the same time the hide substance is again rendered soluble. In the analysis of oakwood extract this powder, tanned as indicated, neutralised with a 3 per cent. solution of borax, washed, dried, ground, re-washed, and again ground and dried, gave results closely agreeing with Freiberg hide-powder in the hands of different workers. Its behaviour with other materials, especially acid liquors, will be described later.—R. L. J.

UNITED STATES PATENT.

Waterproof Dressing and Preservative for Leather. A. Aagaard, Everett, Wash. U.S. Pat. 764,971, July 12, 1904.

DOGFISH oil (5–14 parts), pine or pine-root tar (1–3 parts), turpentine, and a suitable solvent (one or more of these constituents being omitted as desired) are mixed together to form a leather-dressing.—R. L. J.

FRENCH PATENTS.

Tannin Extract Soluble in the Cold; Process for making a Colourless — G. Klenk. Addition, dated March 1, 1904, to Fr. Pat. 316,570, Dec. 5, 1901.

SEE U.S. Pat. 740,283 of 1903; this J., 1903, 1140.—T. F. B.

Glacé Leather [from Intestines]. B. Trenckmann. Fr. Pat. 340,486, Feb. 16, 1904.

THE outer walls of intestines, particularly the cæcum or big gut of the ox, at present turned into gold-beater's skin, are cleaned, very lightly tanned with chrome, alum, or vegetable tannins, and then stuffed with egg-yolk, flour, &c. Two or

more prepared membranes are superimposed on one another, usually grain to grain, so that on drying they form a solid homogeneous sheet without the aid of any adhesive. This "leather" is then degreased by the use of benzine. The preliminary tanning may be omitted or applied after the stuffing process.—R. L. J.

Filtering Material [Hide Powder] for Fats and Oils.
G. Gautier. Fr. Pat. 341,167, March 3, 1904. XII., page 829.

XV.—MANURES, Etc.

Rice; Influence of Varying Ratios of Lime to Magnesia on the Growth of —. K. Aso. Bull. Coll. Agric., Tokyo, 6, 97—102. Chem. Centr., 1904, 2, 255—256.

VEGETATION experiments, in which varying amounts of calcium carbonate and magnesium carbonate were added to a soil containing lime and magnesia in the ratio 1:1, showed that the most suitable "lime factor" for rice is, as in the case of other species of *Gramineæ*, between 1 and 2. The yield of rice varies to a considerable extent with varying ratios of lime to magnesia, an excess of lime over the proper proportion being more injurious than an excess of magnesia.—A. S.

Rice Culture; Practical Application of Manganese Chloride in —. K. Aso. Bull. Coll. Agric., Tokyo, 6, 131—133. Chem. Centr., 1904, 2, 256.

An application of manganese chloride, a by-product in the manufacture of bleaching-powder, corresponding to 25 kilos. of manganese protosulphate, Mn_2O_4 , per hectare, resulted in a yield of rice (grains) one-third greater than that obtained without manganese chloride. The yield of straw was increased to an even greater extent.—A. S.

ENGLISH PATENT.

Fish, Fish Refuse, and the like; Treatment of —.
W. M. Sandison, Ayton, Berwick. Eng. Pat. 15,319, July 19, 1903.

THE fish or fish refuse is reduced to a semi-fluid consistency by boiling and diluting with water. The mixture, while still hot, with or without the addition of chemicals, is decanted to remove the more liquid portion, the liquid and more solid portions being then independently subjected to centrifugal action in machines of the non-perforated drum type. The liquid albuminoid portion obtained is subsequently subjected to further heating or treatment by chemicals, and again passed through the centrifugal machine to separate the fish-oil. The solids are dried to form a manure or "guano."—W. P. S.

FRENCH PATENT.

Manure, and Process for its Manufacture. J. Hamerschlag. Fr. Pat. 340,449, Feb. 15, 1904.

ALKALI or other silicates or silicic acid are added to an alkaline solution or magma of humous substances. The latter are preferably prepared by treating decomposed animal or vegetable bodies with caustic or carbonated alkalis or with ammonia. Such a "silico-humic" preparation may be used as a manure, in some cases, with the partial or entire substitution of phosphates (powdered bones, Thomas slag, or the like) for the silicates; or the humic solutions may be treated with alkaline phosphates. An example is given of a manure made up by adding a mixture of turf, bog earth, lignite, or the like, in small pieces, to an alkaline solution; silicates or phosphates are then added, and the mass is set to ferment in heaps.

—E. S.

XVI.—SUGAR, STARCH, GUM, Etc.

Press-diffusion [Beet Sugar]; Continuous —. Hýroš and Rak. Oesterr. Z. Zuckerind., 1904, 33, 360. Chem.-Zeit., 1904, 28, Rep. 212—213.

THE authors have tested their process of combined diffusion and pressing (Fr. Pat. 318,451 of 1902; this J., 1902,

1462) on the large scale, with a plant consisting of seven vessels, capable of treating 3600 kilos. of beetroots in 24 hours. It is stated that within 40 minutes a juice is obtained of the same concentration as ordinary beet juice, but of higher purity, together with 30 per cent. of "chips," containing 22 per cent. of dry substance with only one per cent. of sugar.—A. S.

Gum Acacia; Detection of — in Powdered Tragacanth.
E. Paget. XXIII., page 840.

XVII.—BREWING, WINES, SPIRITS, Etc.

Yeast; Note on Top-fermentation —. J. J. van Hest. Z. ges. Brauw., 1904, 27, 540—542.

IN connection with the question whether the cells of top-fermentation yeast exercise their chief vital functions in a periodic manner, samples of wort were pitched with different quantities of yeast, the progress of attenuation and extent of yeast reproduction being noted at regular intervals. With the smallest amount of yeast (4 c.c. per hectolitre) attenuation commenced between the second and third days, the extract consumed being for the most part utilised by the newly-formed cells, the bulk of which were produced during the same period. After the fourth day the yeast entered into the stage of physiological activity (production of zymase), the attenuation increasing up to the sixth day, to thereafter recede, owing to the exhaustion of fermentable sugar. In this case, therefore, the periodic action was clearly observed, the biological activity predominating during the first three days and the physiological action during the last three. In proportion as the amount of pitching yeast was increased, the difference became less marked, the attenuation commencing earlier owing to the presence of a larger number of cells sufficiently mature to discharge their physiological functions at the outset. These results are considered to harmonise with those obtained by the author in connection with the absorption of nitrogen and formation of alcohol during fermentation (this J., 1904, 73).—C. S.

Yeast; Note on the Longevity of Culture —. II. Wichmanu. Allgem. Z. f. Bierbrau., 1904, 32, 322.

CONFIRMING Henneberg's observation that yeast cells on the surface of the culture vessel live longer than those at the bottom (this J., 1904, 672), the author finds that greater longevity is exhibited by cells in the ring of yeast adhering to the walls of the flask when cultures are made in wort, than by the cells of sedimental yeast. Since no ascospores could be detected in the ring cells, the greater longevity of the latter seems due to the presence of a more favourable environment in that situation. For re-inoculation the author finds that the ring cells give more vigorous growth, and he therefore shakes the flask, to ensure proper admixture of the ring and sedimental cells, before making the transfer to the new medium. It is regarded as a sign of weakly or dead cells when the sedimental yeast diffuses too readily on shaking.—C. S.

Amylase. [Influence of Various Substances on the Diastatic Power of Malt.] J. Effront. Monit. Scient., 1904, 18, 561—565.

FORD has concluded from his experiments (this J., 1904, 414) that asparagine does not augment diastatic action unless there has been previous restriction, due to alkalinity of the starch or to some other cause. As this conclusion is in opposition to previously published statements of the author (this J., 1893, 368, 851; 1896, 127), the latter has repeated his experiments, the results of which confirm his first statement. The influence of other amino bodies was also tried. Aspartic acid had practically the same effect as asparagine, viz., 9 to 10 times more maltose formed. Glycocoll, sarcosine, leucine, hippuric acid, creatine, &c., also favoured the diastatic action. Succinamide was found to retard the action. The action of the amides is independent of the temperature and degree of alkalinity of the starch paste.—W. P. S.

Sulphurous Acid in Wine. W. Kerp. Arbb. Kais. Gesund.-Amt., 21, 141—225; 372—376. Chem. Centr., 1904, 2, 56—59.

THE author deals with the amount, condition, and action of sulphurous acid in wine. A review is given of the statements in literature with respect to the amount of sulphurous acid in wine, from which it appears that of 1,071 samples, 460, or 42.95 per cent., contained up to 50 mgrms. of sulphur dioxide per litre; 366, or 34.18 per cent., contained from 51 to 100 mgrms.; 150, or 14.00 per cent., contained from 101 to 150 mgrms.; 63, or 5.88 per cent., contained from 151 to 200 mgrms.; and 32, or 2.99 per cent., contained more than 200 mgrms. of sulphur dioxide per litre. With regard to free sulphurous acid, of 475 wines, about 75 per cent. contained from 1 to 10 mgrms. and a further 5 per cent. from 11 to 20 mgrms. per litre. The sulphurous acid addition compounds of aldehydes undergo hydrolytic dissociation in aqueous solution to a degree depending upon the nature of the aldehyde, the temperature, and the concentration of the solution. The dissociated sulphurous acid can be titrated directly with iodine solution and is reckoned as free sulphurous acid on analysis. Acetaldehyde-sulphurous acid is dissociated to only a small extent, but dextrose- and levulose-sulphurous acid are dissociated to a much greater degree. In sulphited musts and in strongly sulphited sweet wines, dextrose- and levulose-sulphurous acid are present, but in moderately sulphited, completely fermented wines, the sulphurous acid is combined with acetaldehyde. The pharmacological action of aldehyde-sulphurous acid compounds is due to the dissociated sulphurous acid, and its intensity can therefore be measured by the iodine-absorption of the aqueous solution of the compounds.—A. S.

Enzymes; Study of the Instability of — K. Aso. XXIV., page 842.

ENGLISH PATENTS.

Non-deposit Beer; Apparatus for the Production of — and for Clarifying Liquids and Carbonating the same. A. P. Blaxter, A. P. Blaxter, jun., and G. W. Chaloner, trading as Barnett and Foster, all of London. Eng. Pat. 28,327, Oct. 28, 1903.

INSTEAD of employing a vessel with internal stirring arrangements, the patentees use apparatus for chilling or carbonating liquids, so constructed as to be rotated as a whole. The vessel is cylindrical in shape, is provided with runners which rest upon grooved rollers, and is fitted with internal trough-like blades, which, as the vessel rotates, raise up some of the liquid and spill it back again into the bulk. The various connections in and out of the vessel are made by way of the trunnions.—W. P. S.

Varnishing, Pitching, or similarly treating Casks, Vats, or the like; Apparatus for — M. D. Krämer. Eng. Pat. 12,647, June 3, 1904. I., page 814.

UNITED STATES PATENTS.

Fermentation of Bottom-fermented Beer under Pressure; Process of carrying through the — V. Lapp, Leipzig, Germany. U.S. Pat. 766,271, Aug. 2, 1904.

SEE Fr. Pat. 320,264 of 1902; this J., 1903, 157.—T. F. B.

Fermentation-Gas [Carbon Dioxide]; Apparatus for Treating — J. F. Wittemann, Brooklyn, Assignor to The Wittemann Co., New York. U.S. Pat. 766,481, Aug. 2, 1904.

SEE Eng. Pat. 64 of 1900; this J., 1900, 459.—T. F. B.

Storage Vessels [for Beer]; Process of Treating — V. Lapp, Leipzig, Germany. U.S. Pat. 766,506, Aug. 2, 1904.

SEE Eng. Pat. 3682 of 1904; this J., 1904, 556.—T. F. B.

FRENCH PATENT.

Spirit; Process for Maturing — L. Wittenberg and H. Kaufmann. Fr. Pat. 340,861, March 1, 1904.

IN order to colour and to remove unpleasant taste from freshly distilled spirit (brandy and the like), the latter is

treated with finely divided cork, or passed through a filter containing the same.—W. P. S.

XVIII.—FOODS: SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(A.)—FOODS.

Texas Cottonseed Meal; Composition of — H. H. Harrington and G. S. Fraps. Texas Agric. Exp. Stat. Bull., 70, 3—15. Chem. Centr., 1904, 2, 245—246.

OF 46 samples of Texas cottonseed meal from 84 different districts, 14 contained over 7.9 per cent. of nitrogen, 19 from 7.5 to 7.9 per cent., and 13 from 7 to 7.5 per cent. Of 151 samples from other States, only 8 contained more than 7.5 per cent. and none more than 7.9 per cent. of nitrogen. The average composition of American cottonseed meal obtained from 400 samples was:—Water, 8.52; ash, 7.2; protein, 43.26; crude fibre, 5.44; non-nitrogenous extractive matter, 22.31; fat, 13.45 per cent. The samples of Texas meal richest in nitrogen came from the western portion of the State, and those poorest in nitrogen from the eastern portion. It is probable that the difference is connected with the varying moistness of the soil, as the western portion of Texas has the smallest rainfall. The cottonseed husks had the composition:—water, 11.36; ash, 2.73; protein, 4.18; crude fibre, 45.32; non-nitrogenous extractive matter, 34.19; fat, 2.22 per cent. They contained 0.69 per cent. of nitrogen, 0.25 per cent. of phosphoric anhydride, and 1.02 per cent. of potassium oxide.—A. S.

Lard from Hogs fed on Cottonseed Meal; Reaction of — with Halphen's Reagent. E. Fulmer. J. Amer. Chem. Soc., 1904, 26, 837—851.

EXPERIMENTS were made with 23 animals which were fed with varying quantities of cottonseed meal during a period of 84 days, the minimum amount eaten by one individual being 7.7 lb. and the maximum 154 lb. Lard rendered from samples of fat from each animal gave distinct and, in some instances, strong colorations with Halphen's reagent, the intensity of coloration expressed in equivalents of cottonseed oil ranging from 0.4 to 15 per cent. In general, lard from kidney fat gave the greatest degree of coloration, and lard from intestinal fat the least. The substance producing the coloration is transmitted to all parts of the animal, though in unequal amounts. Once deposited in the fat of the animal the colour-producing substance is very persistent. Thus, an animal killed three months after it had received its last portion of cottonseed meal yielded lard giving a coloration equivalent to 4 per cent. of cottonseed oil, and lard from another killed five months after the last portion gave a coloration equivalent to 3 per cent. of oil. (See also this J., 1903, 113.)

—C. A. M.

ENGLISH PATENTS.

Treating Finely Divided Materials such as Flour with a Gaseous Agent; Apparatus for — S. Leatham, York. Eng. Pat. 16,472, July 27, 1903.

THE apparatus is intended for effecting the conditioning, sterilising, &c., of flour, meal, bran, and the like. The flour is fed into one end of a horizontal box or trough, the bottom of which is provided with transverse ribs on its upper surface, and which is capable of a horizontal reciprocating motion. The top of the box is provided with partitions projecting downwards, and is capable of a vertical reciprocating motion. Specially constructed gas inlets are provided, and when the apparatus is in use, the flour is carried forward, stirred up, and thoroughly exposed to the action of the gas.—W. H. C.

Preservative for Foodstuffs, Articles of use, and the like. A. J. Boulton, London. From K. Rücker and D. J. Pickée, both of Gorinchem, Holland. Eng. Pat. 18,428, Aug. 26, 1903.

THE articles of food, or boxes for containing the same, are dipped in the preservative claimed, which consists of linseed

oil, 60 per cent.; colophony soap, 20 per cent.; and shellac, 20 per cent. Glycerin and wax may also be added to render the skin formed on the articles sufficiently flexible. The preservative is melted by heating before dipping the articles in it.—W. P. S.

Casein; Process for the Preparation of a Clear Solution of —. A. P. Horn, Hamburg. Eng. Pat. 20,063, Sept. 17, 1903.

SEE Fr. Pat. 335,799 of 1903; this J., 1904, 265.—T. F. B.

UNITED STATES PATENT.

Albumin from Milk; Process of Extracting Soluble —. C. Lewis, Toronto. U.S. Pat. 765,898, July 26, 1904.

SEE Eng. Pat. 11,094 of 1904; this J., 1904, 797.—T. F. B.

FRENCH PATENT.

Food Product from Sweet Cassava; Production of a —. H. W. van Dalfsieu. Fr. Pat. 340,845, March 1, 1904.

THE root is reduced to a pulp by boiling in a closed vessel or by roasting, and is then rolled into sheets, the latter being finally dried or baked and ground. If desired, vermicelli may be added to the pulp.—W. P. S.

(B.)—SANITATION; WATER PURIFICATION.

ENGLISH PATENTS.

Liquids [Sewage]; Biological Purification of —; with Continuous Operation and Plant used in connection therewith. C. Peters, Borsfleth, Germany. Eng. Pat. 16,494, July 27, 1903.

THE liquid is fed on to a series of basins by suitable means, the said basins consisting of an upper layer of fine slag and a lower layer of coarser slag. These basins are placed on a bed of coarse slag, bricks, or coke, either sunk in the ground or raised above it. The basins are surrounded by borders sloping upwards, and between the basins the coarse understructure is exposed to the air. Suitable channels are placed below the understructure to drain off the effluent and also to supply air to the bed.—W. P. S.

Tanks; Settling or Precipitating —. A. Fidler, Northampton. Eng. Pat. 18,570, Aug. 28, 1903.

THE tank circular in shape and similar to that described in Eng. Pat. 19,249, 1897 (this J., 1898, 787), is provided with a blade or spiral moving concentrically, which carries the sludge into a sump placed at the bottom of the tank. When the sump is full of sludge a valve on the discharge pipe is opened and the sludge forced out by the head of liquid in the tank. A horizontal plate fixed just above the sump, and of slightly larger diameter than the latter, prevents any sudden rush of liquid into the sump and consequent disturbance of and mixture with the sludge.

—W. P. S.

Sewage, Bacterial or Septic Tank; Treatment of —. V. Bordigoni, Paris. Eng. Pat. 11,900, May 25, 1904.

THE septic tank described is preferably made of concrete and is covered so as to be air-tight. It is divided into four compartments. In the first the sewage is received through a pipe. A partition reaching from the top of the tank to nearly the bottom separates the first compartment from the second. As the sewage flows from the first to the second compartment it passes between baffle plates placed at the bottom of the latter. A syphon-tube establishes communication between the second and third divisions. The fourth compartment is separated from the third by a partition, perforated at its base and reaching nearly to the top of the tank. This last compartment contains filtering materials and is provided with a discharge pipe for the purified effluent. The latter two compartments are only one-half the size of the first two.—W. P. S.

Sewage [Sludge]; Treatment of — [Fuel Briquettes]. A. McLean, London, and W. Paterson, Dumfries. Eng. Pat. 12,232, May 30, 1904.

THE sludge obtained from a settling tank is partially dried by placing it in a vessel having a filtering cloth for its

bottom, and producing a reduced pressure below this vessel. The partially dried sludge is then mixed with from 5 to 10 per cent. of powdered unslaked lime, and completely dried on a "hearth." The dry residue may now be mixed with about 5 per cent. of coal tar or the like, and pressed into briquettes for use as fuel.—W. P. S.

Air for Respiration Purposes; Process and Apparatus for Regenerating Breathed Out —. M. Bamberger, F. Bock, and F. Wanz, all of Vienna. Eng. Pat. 8865, April 14, 1904.

THE apparatus described is intended for use with a mask. It has the shape of a cylinder, and is divided into two chambers by means of asbestos partitions. A tube filled with water is placed down the centre of the apparatus. When required for use, a tube at the top is connected to the mask and a piston rod pressed down, thereby puncturing lead partitions in the apparatus, and allowing the water in the tube to flow into the lower chamber, which contains sodium peroxide or potassium tetroxide. The oxygen evolved is collected in a gas bag at the lower part of the apparatus. The breathed-out air enters the upper chamber, which is also filled with the alkali peroxide, through a filter. The moisture and carbon dioxide are thus removed, and the air, after being mixed with a quantity of the oxygen in the gas bag, is drawn back into the mask.—W. P. S.

Water Purifying Apparatus. A. Woodall, Manchester. Eng. Pat. 19,916, Sept. 16, 1903.

IN order to remove the suspended impurities from the waste water of mills, bleach works, &c., especially matters of a fibrous nature, the water is passed through a perforated trough arranged in a trench. A series of brushes are arranged in, and parallel with, the axis of the trough, and are rotated so as to "sweep" the suspended matters out of the water on to a perforated plate at one side of the trough.

—W. H. C.

Liquids [Water], Treatment of —, with Ozonised Air or other Gaseous Ozone Mixtures. A. G. Bloxam, London. From E. Dillan, Berlin. Eng. Pat. 20,163, Sept. 18, 1903.

IN the process of sterilising water by means of ozonised air, described in Eng. Pat. 9183 of 1901, the ozonised air was found to become vitiated owing to gaseous impurities present in the water. To overcome this difficulty, the water to be sterilised is caused to fall, in the form of spray, first through a vessel placed above the steriliser proper. A current of air blown across the falling spray removes the impurities.—W. H. C.

UNITED STATES PATENTS.

Organically Contaminated Liquids [Sewage]; Apparatus for Testing —. W. D. Scott-Moncrieff. U.S. Pat. 765,794, July 26, 1904. XXIII, page 837.

Water; Method of Purifying —. W. M. Jewell, Winnetka, and W. J. McGee, Oak Park, Ill., Assignors to themselves and to O. H. Jewell, Chicago. U.S. Pat. 766,146, July 26, 1904.

BARIUM carbonate and a "soluble reagent" are added to the water and the mixture electrolysed.—W. P. S.

FRENCH PATENTS.

Soap for use by Lead Workers; Manufacture of a —. Chem. Werke G. m. b. H. vorm. C. Zerbe. Fr. Pat. 841,159, Feb. 25, 1904. XII, page 829.

Sewage and other Refuse; Treatment of —. J. L. E. Garrigou. Fr. Pat. 340,740, Feb. 26, 1904.

THE liquid and solid portions of the sewage are separated either by filtration or allowing them to settle. The liquid portion is heated with slaked lime in a retort, whilst the solids are mixed with felspar and heated in a second retort. The products of distillation are collected in suitable absorbing chambers attached to each retort. The whole plant is enclosed in a dome-shaped building, from which

the air is continuously drawn and passed through absorbing vessels, in order to collect volatile gases evolved during the filtration, &c.—W. P. S.

Coal Mines; Artificial — R. J. P. Cottangin.
Fr. Pat. 841,333, March 15, 1904. II., page 816.

Pressure Filters, for Water and other Liquids. C. E. Chamberland. Fr. Pat. 840,587, Feb. 20, 1904.

THE inner cylindrical filtering bodies have each an enlargement at the top, the shoulder of which fits upon the top of an outer vessel enclosing the filter, and thus completing the whole apparatus. The joint is rendered tight by means of a clamp and some kind of suitable packing material. The water to be filtered enters at the bottom of the outer vessel by a perforated cross tube, whilst the filtered water leaves by a similar tube in the enlargement at the top of the filter body or cylinder. Such filters can be used singly, or may be grouped together to form a battery.—W. H. C.

(C).—DISINFECTANTS.

ENGLISH PATENT.

Antiseptic Compounds and Process for Manufacturing the same. H. H. Lake, London. From F. Stearns and Co., Detroit, U.S.A. Eng. Pat. 8415, April 12, 1904.

ON treating intermolecular anhydrides of dibasic acids with hydrogen peroxide, peroxide acids having antiseptic properties are obtained. Five parts of succinic anhydride are agitated for about half an hour with 18 parts of 7 per cent. hydrogen peroxide. The precipitate consists of the succinic peroxide acid, probably $\text{HO.CO}(\text{CH}_2)_2\text{CO.O.O.CO}(\text{CH}_2)_2\text{COOH}$. It is a soluble, crystalline substance, melting at 128°C . with evolution of gas, contains 6.8 per cent of active oxygen, and is non-toxic. On long standing with water, the substance is hydrolysed to succinic acid and succinic mono-per acid, $\text{HO.CO}(\text{CH}_2)_2\text{CO.O.O.H}$.

—T. F. B.

XIX.—PAPER, PASTEBOARD, Etc.

Kaolin [for Paper-making]; Amount of Water in —.
Papier-Zeit, 1904, 29, 2285.

ATTENTION is drawn to the widely varying amounts of water in the various clays used by paper-makers for "filling" purposes. For instance, Bohemian clays contain from 3 to 6 per cent. of water, whilst in English clays, the quantity varies from 10 to 20 per cent. Some limit is considered necessary to prevent waste as regards price and freight.—W. P. S.

ENGLISH PATENTS.

Oilcloth or Linoleum; Article of Manufacture for use as a Substitute for — [from Paper Pulp]. W. Melville and W. V. Rees. Eng. Pat. 12,663, June 4, 1903. XIII. B., page 829.

Paper Coated on one Side with Coloured Material, Process and Apparatus for Producing —. C. Tittel, Josefthal, Austria. Eng. Pat. 10,798, May 10, 1904.

COLORING materials are allowed to flow in a regulated horizontal stream upon a wet layer of paper as this is formed on the wire frame of a paper-making machine, being united with the paper by the operations of couching, pressing, and drying. The special apparatus employed to this end consists of a tipping trough, extending across the layer of paper, rendered adjustable by means of screw gear at its front, and communicating with a sluice-box fitted with a vertically adjustable gate, in combination with an apron, a squeezing roller, and a perforated pipe lying horizontally along the back of the trough, and connected with a vertical pipe, provided with a cock and an indicator, for the supply of the coloring materials from a mixing tank to the trough. The coloring materials flow through the sluice upon the apron, from which they are uniformly distributed on to the squeezing roller, which applies them to the layer of paper travelling along underneath.—E. B.

Solutions of Cellulose in the Manufacture of Filaments; Apparatus for Pumping and Controlling the Passage of Liquids or Semi-liquids, and more especially of —. C. H. Stearn, London, and C. F. Topham, Kew. Eng. Pat. 16,605, July 28, 1903.

THE cellulose solution is kept under sufficient pressure to raise the inlet valve and pass into the body of the pump, but the delivery valve is held in position by a spring sufficiently strong to resist this pressure. By throwing the plunger of the pump into motion, however, sufficient pressure is obtained to open the delivery valve. Hence no air bubbles can get into the solution on suction and the pump can be used to regulate the thickness of the filaments by altering the speed. In order to give an even flow of solution from the pump, an air chamber is in communication with the passage leading from the delivery valve to the outlet.—G. W. McD.

Phonographic Cylinders, &c.; [Celluloid-Stearin] Composition for the Manufacture of —. A. Defavrie, Paris. Eng. Pat. 19,163, Sept. 5, 1903. ✓

CELLULOSE containing a certain proportion of stearic acid in addition to the usual ingredients.—C. A. M.

Incandescent Mantles [Wood Cellulose]. Evered & Co., Ltd. From C. Weiblen. Eng. Pat. 22,451, Oct. 17, 1903. II., page 816.

UNITED STATES PATENT.

Drying Machine [for Paper]. S. A. Cohen, New York. U.S. Pat. 764,561, July 12, 1904.

THE paper to be dried passes over a set of feed rollers with tapes, in a straight path, and is subjected to an air blast issuing from a perforated plate. The paper then passes over a semicircular set of rollers to a second straight set, where it is again subjected to an air blast. Means are provided for preventing anything coming into contact with the paper except the air.—W. H. C.

FRENCH PATENTS.

Viscose; Treatment of —. Soc. Franç. de la Viscose. Fr. Pat. 340,563, Feb. 19, 1904.

VISCOSE, which has been gelatinised and cooled, is treated, in a rotating drum, with a solution of sea salt, with or without sodium bicarbonate. For example, for 100 kilos. of viscose containing 10 per cent. of cellulose, may be used a solution of 10 kilos. of sea salt and 10 kilos. of sodium bicarbonate in 100 litres of water. The mother liquor is then run off, and the viscose again treated with a 50 per cent. solution of sodium chloride. The effect of this treatment is the removal of alkali sulphides and polysulphides.—T. F. B.

Viscose; Apparatus for Extracting the Air and Free Carbon Bisulphide contained in —. Soc. Franç. de la Viscose. Fr. Pat. 340,690, Feb. 24, 1904.

AN air-tight conical vessel is provided with a rotating conical plate, on which the viscose is fed through a pipe in the top of the vessel. Projections are fixed on to the lower part of the conical plate, to throw the viscose on to the sides of the vessel, which is evacuated during the operation; this treatment removes all air and dissolved carbon bisulphide from the viscose, which finally falls into a trough at the bottom of the vessel, and is run off through a side tube.—T. F. B.

Viscose; Automatic Machine for Firing Filaments of —. Soc. Franç. de la Viscose. Fr. Pat. 340,812, Feb. 27, 1904. V., page 821.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Cerium Compounds; Study of some —. J. Sterba. Ann. Chim. Phys., 1904, 2, 198–232. Chem. Centr., 1904, 2, 84–85. (See this J., 1901, 927.)

Preparation and Purification of Cerium Oxide.—For the separation and the detection of iron in presence of excess

of cerium, the following rapid method is useful. It is based upon the fact that a solution of a cerous salt is not immediately precipitated by a small excess of ammonia. The solution containing the cerium in the cerous condition is treated with ammonia till all the cerium is precipitated, and the liquid has a strongly alkaline reaction; glacial acetic acid is then added till the precipitate is just redissolved, leaving the liquid still alkaline, and the solution is saturated with hydrogen sulphide. The precipitate is filtered off, the solution acidified with acetic acid, and the hydrogen sulphide expelled. For the separation of larger quantities of iron from a smaller quantity of cerium, the method proposed by Rose for the separation of zirconium and iron appears to be the most useful one. The solution is treated with tartaric acid, made alkaline with ammonia, and the iron precipitated by hydrogen sulphide.

Ceric Oxide.—Ceric oxide prepared by ignition of the oxalate, formate, succinate, acetate, or sulphate, or of the hydrated oxide, may have a faint lemon yellow colour, due to the formation of higher oxides, even when foreign earths are absent. Hydrated ceric oxide, $\text{CeO}_2 \cdot \text{H}_2\text{O}$, is obtained by treating a solution of cerous nitrate with a cold solution of sodium peroxide. The voluminous precipitate becomes denser and acquires a lemon-yellow colour on boiling. Crystalline ceric oxide is pure white, but becomes somewhat reddish-brown if it comes in contact with the air.

Cerium Sulphide.—By the action of hydrogen sulphide on ceric oxide, hydrated ceric oxide, cerous sulphate or cerous carbonate at a bright red heat, cerous sulphide, Ce_2S_3 , is produced. It is a purple-red microcrystalline powder, which, when heated in air, loses sulphur, and is converted into a mixture of ceric oxide and cerous sulphate. It is decomposed by cold dilute acids, but is practically unacted upon by cold or boiling water, ammonium sulphide and alkali polysulphides. If white ceric oxide be heated cautiously for 1 hour in a current of moist hydrogen sulphide, a golden-yellow oxysulphide is formed, having approximately the composition $\text{Ce}_2\text{O}_3\text{S}$, which, when exposed to the air, changes slowly into a more stable, grass-green oxysulphide. According to the author the golden-yellow crystalline sulphide described by Mosander does not exist.

—A. S.

Stovaine: a new Local Anæsthetic. E. Fourneau. J. Pharm. Chim., 1904, 20, 108—109.

The hydrochloride of the benzoyl ether of dimethylaminopentanol $(\text{CH}_3)_2(\text{C}_2\text{H}_5)[\text{CH}_2 \cdot \text{N}(\text{CH}_3)_2 \cdot \text{HCl}] \cdot \text{C}_6\text{H}_5 \cdot \text{COC}_6\text{H}_5$, which has been introduced into medicine under the name of stovaine, possesses anæsthetic properties comparable with those of cocaine. It is obtained by acting on dimethylaminoketone with ethylmagnesium bromide; ethyldimethylaminopropanol or dimethylaminopentanol is thus obtained, which, when treated with benzoyl chloride, gives stovaine. It occurs in small brilliant lamellæ, m. pt., 175°C . It is very soluble in water, alcohol, and acetic ester, sparingly soluble in acetone.—J. O. B.

Populin [Benzoylsalicin]; Simple Method of preparing — L. Dobbin and A. D. White. Brit. Pharm. Conf., Aug. 1904; Pharm. J., 1904, 73, 233.

POPULIN may be satisfactorily obtained by benzoylating salicin by Schotten-Baumann's reaction. A solution of 20 grms. of salicin in a litre of water, was rendered alkaline with potassium hydroxide, and 10 grms. of benzoyl chloride added very slowly with constant agitation; more alkali being added from time to time, to avoid the formation of much free acid. The populin formed separated at once, forming a bulky white precipitate, which was collected, dried, powdered, and extracted with ether. On recrystallising the residue insoluble in ether from boiling water, then from hot alcohol, pure populin, m. pt., 180°C ., was obtained.

—J. O. B.

Nux Vomica Seeds; Distribution of Fats and Strychnine in — H. W. and S. C. Gadd. Brit. Pharm. Conf., Aug. 1904; Pharm. J., 1904, 73, 246.

THE hairs covering the seeds of *Strychnos nux vomica* are found to contain much more fat, and relatively less strychnine than the embryo of the seeds, and this fat is more readily removed by 70 per cent. alcohol from the hairs

than from the other parts. Consequently decorticated seeds are recommended for the preparation of galenical products of nux vomica.—J. O. B.

Amorpha Fruticosa; Constituents of the Essential Oil of — V. Pavesi. Estr. aus Rendiconti del R. Ist. Lomb. di sc. e lett., 37, 487—494. Chem. Centr., 1904, 2, 224. (See this J., 1904, 558.)

THE portion of the oil boiling below 250°C . contains a terpene boiling at 80° — 120°C . under 80 mm. and 150° — 220°C . under 750 mm. pressure; sp. gr. at 15°C ., 0.8717; refractive index, 1.4811 at 15.5°C . The portion boiling between 250° and 270°C . contains cadinene and another terpene, for which the author proposes the name *amorphene*, $\text{C}_{15}\text{H}_{24}$, sp. gr. at 15°C ., 0.916; refractive index at 15°C ., 1.50652. Amorphene differs from cadinene in that its hydrochloride is liquid.—A. S.

Burdock Root; Essential Oil of — Haensel's Report, July 1904; through Apoth. Zeit., 1904, 19, 557.

BURDOCK root yielded 0.176 per cent. of a brownish-yellow oil having an acid reaction; sp. gr. at 25°C ., 0.9695; $[\alpha]_D = +1.24^\circ$ at 30°C .; acid value, 13.5; saponification value, 236.6; readily soluble in 80 per cent. alcohol. The oil contains palmitic acid.—J. O. B.

Conium Maculatum; Essential Oil of — Haensel's Report, July 1904; through Apoth. Zeit., 1904, 19, 557.

Essential Oil of Conium Herb.—The herb free from flowers gave 0.0765 to 0.078 per cent. of a dark brown, unpleasant smelling, acid essential oil which deposited stearoptene at low temperatures. It had the sp. gr. 0.9502 at 15°C .; acid value about 60; saponification value about 70. On rectification by steam distillation only 25.15 per cent. of the original oil distilled over, the dark-coloured residue solidifying on cooling. The rectified oil was brownish, acid in reaction and had an odour almost similar to that of the crude product. It had the sp. gr. 0.9310 at 20°C .; $[\alpha]_D = -12.4^\circ$ at 20°C .; saponification value 36. It was readily soluble in 90 per cent. alcohol and in about 80 parts of 80 per cent. alcohol. Palmitic acid was isolated from the residue.

Essential Oil of Conium Fruits.—The fruits yielded 0.0179 per cent. of essential oil of a brownish-black colour, with a repulsive odour and taste, neutral in reaction; saponification value, 34; sp. gr., 0.8949 at 15°C . On rectifying 51 per cent. of a greenish-yellow oil was obtained having the sp. gr. 0.8313 at 15°C .; $[\alpha]_D = -2.16^\circ$ readily soluble in 96 per cent. alcohol, sparingly dissolved by 80 per cent. alcohol.—J. O. B.

Odorous Principles; Mechanism of the Circulation of — in the Plant. E. Charabot and G. Lalone. Bull. Soc. Chim., 1904, 31, 884—896.

FROM experiments performed with the bitter orange *Citrus bigaradia* in various stages of growth, it is concluded that the chemical changes undergone by the terpene compounds of the portion of the essential oil contained in the stem of the tree renders it less soluble in water than the corresponding essential oil of the leaves. This difference, slight at first, increases as vegetation advances. The osmotic pressure in the stem tends to diminish, whilst a certain amount of the more soluble constituents, following the laws of diffusion, are transferred from the leaves to the stem. On arrival there, they throw out of solution, if the stem sap be nearly saturated, the least soluble of the dissolved odorous bodies. A transference is, therefore, constantly in progress from the leaf to the stem, or from the point where the odorous substances are most actively formed to where they become, relatively, less soluble. The oil of the leaves is found to be distinctly less rich in esters than that of the stem. In young leaves the total esters amounted to 30.8 per cent. of the oil, calculated as linyl acetate, against 39.0 per cent. in the young twigs; mature leaves gave 31.1 per cent.; and mature twigs 62.0 per cent. The free alcohols in young leaves amounted to 31.3 per cent., in young twigs to 28.4 per cent., in old leaves to 30.0 per cent., whilst old twigs contained but 3.2 per cent.—J. O. B.

Thorium from Cerium, Lanthanum, and Didymium; Separation of — by Metanitrobenzoic Acid. A. C. Neish. XXIII., page 839.

Methyl Alcohol in Commercial Formaldehyde; Determination of —. M. J. Stritar. XXIII., page 841.

ENGLISH PATENTS.

Pyrimidine Derivatives [Alkyl Barbituric Acids]; Manufacture of —. H. E. Newton, London. From Farbenfabr. vorm. F. Bayer and Co., Kilderfeld. Eng. Pat. 18,246, Aug. 24, 1903.

SEE U.S. Pat. 744,782 of 1903; this J., 1904, 35.—T. F. B.

Cod-liver Oil; Manufacture of a Substitute for —. K. F. Töllner, Bremen, Germany. Eng. Pat. 2081, Jan. 27, 1904. ✓

ALGACEOUS plants rich in iodine are dried and extracted with a suitable fatty oil (e.g., sesamé oil) or mixture of fatty oils and the oily extract filtered; or, the dried seaweed may be roasted and pulverised before the extraction, and alcohol used as a solvent in addition to the fatty oil.

—C. A. M.

Oil from the Rind of Limes and other Citrus Fruits; Machine for Extracting —. R. G. Hunter, Whitely Bay, Northumberland. Eng. Pat. 13,171, June 10, 1904.

THE limes pass down a shoot to a partitioned hopper, being admitted to the latter by alternately operated feeders, and then through feed tubes to an extracting device consisting of plates provided with points on their surfaces and capable of moving horizontally and vertically in opposite directions at different speeds. The rinds are thus punctured and the extracted oil flows off by suitable channels. The fruit then passes out of the machine into a lateral receptacle.

—W. P. S.

UNITED STATES PATENTS.

Cyclic Ketones [Ionone]; Process of Making —. P. Chuit, Geneva, and F. Bachofen, New York, Assignors to the Firm of Chuit, Naef, and Co., Geneva. U.S. Pat. 765,459, July 19, 1904.

SEE Fr. Pat. 326,982 of 1902; this J., 1903, 880.—T. F. B.

Sulpho-Acid Ester and Process of Making Same. E. Sapper and F. Reubold, Assignors to Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine. U.S. Pat. 765,597, July 19, 1904.

SEE Eng. Pat. 17,847 of 1903; this J., 1904, 798.—T. F. B.

Sulphur Baths; Process of Preparing Compositions for —. W. Matzka, Vechelde, Germany. U.S. Pats. 765,291, July 19, 1904, and 766,154, July 26, 1904.

SEE Eng. Pat. 20,548 of 1903; this J., 1903, 1306.—T. F. B.

Cod-liver Oil; Process of Making a Substitute for —. K. F. Töllner, Bremen, Germany. U.S. Pat. 765,943, July 26, 1904.

SEE Eng. Pat. 2081 of 1904; preceding these.—T. F. B.

FRENCH PATENTS.

Trimethylcyclohexanone Carboxylic Ester; Process for Manufacturing —. Cie. Paris. Coul. d'Aniline. Fr. Pat. 338,814, May 23, 1903.

SEE U.S. Pat. 743,305 of 1903; this J., 1903, 1307.—T. F. B.

Hydroxy-cyclohexanecarboxylic Acids and their Esters, Cyclohexanecarboxylic Acids and their Esters, and Hydroxycyclohexanecarbinols; Process of Making —. Cie. Paris. Coul. d'Aniline. Fr. Pat. 338,815, May 23, 1903.

SEE Eng. Pat. 11,137 of 1903; this J., 1904, 502.—T. F. B.

Heating of Carbon [Electrically]; Process of —, applicable in Chemical and other Analogous Processes [Manufacture of Carbon Bisulphide]. Soc. Anon. Prod. l'Ind. Verrière et ses Dérivés. Fr. Pat. 340,846, March 1, 1904. XI. B., page 828.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Emulsions [Photographic]; Pyridine as a Ripening Agent for —. O. N. Witt. Phot. Mitt., 1904, 41, 235—236.

PYRIDINE may be advantageously used to accelerate the "ripening" of emulsions; the process can be prolonged for a considerable time at 100° C., without fear of the emulsions being liable to fog, and there is no great tendency to form coarse-grained emulsions. The process may be carried out by sensitising the emulsion, not with silver nitrate, but with the double salt of pyridine and silver nitrate, $\text{AgNO}_3(\text{C}_5\text{H}_5\text{N})_2$; the unripened emulsion gives very "slow" plates, which produce negatives of good contrast, whilst on heating the emulsion, it becomes highly sensitive, without losing the power of giving clear negatives.

—T. F. B.

ENGLISH PATENT.

Photographic Paper. A. Zimmermann, London. From Chem. Fabr. auf Actien, vorm. E. Schering, Berlin. Eng. Pat. 20,325, Sept. 21, 1903.

SEE Fr. Pat. 335,807 of 1903; this J., 1904, 268.—T. F. B.

FRENCH PATENTS.

Photography [in Colours]. B. Jumeaux and W. N. L. Davidson. Fr. Pat. 341,359, Feb. 13, 1904. Under Internat. Conv., Feb. 17, 1903.

SEE Eng. Pat. 3730 of 1903; this J., 1904, 336.—T. F. B.

Flash-light Powder; Photographic —. Act.-Ges. f. Anilinfabr. Fr. Pat. 340,459, Feb. 15, 1904.

TWO parts of magnesium or aluminium powder are mixed with two parts of cerium or thorium nitrate, or with one part of zirconium nitrate; the double salts of these nitrates with other nitrates may also be employed. These flash-lights are said to burn with practically no smoke, giving a flash of great actinic power, and of much shorter duration than those prepared with chlorates or peroxides.—T. F. B.

Ceramic, Porcelain, and Enamelled Objects; Production of Coloured Images on —. E. Zerr. Fr. Pat. 340,628, Feb. 22, 1904. VIII., page 824.

XXII.—EXPLOSIVES, MATCHES, Etc.

ENGLISH PATENTS.

Gun-cotton Blocks; Pressing of —, and Apparatus therefor. G. W. Bell, Ipswich. Eng. Pat. 17,890, Aug. 18, 1903.

SEE Fr. Pat. 340,473 of 1904, following these.—T. F. B.

Explosives. C. O. Lundholm (Nobel's Explosives Co., Ltd.), Stevenston, Scotland. Eng. Pat. 19,438, Sept. 2, 1903.

BY the addition of nitro-glycerin to ammonium nitrate explosives, products are obtained which can easily be exploded with a No. 6 detonator. A suitable composition for blasting consists of ammonium nitrate, 80 parts; nitro-glycerin, 10 parts; wood-meal, 10 parts. Such explosives are hygroscopic, and must be enclosed in waterproof wrappers.—T. F. B.

Explosives or Blasting Compositions. M. Bielefeldt, Berlin. Eng. Pat. 20,216, Sept. 19, 1903.

SEE Fr. Pat. 335,801 of 1903; this J., 1904, 269.—T. F. B.

Explosives; Impts. in — C. H. Curtis, C. L. W. Smith, D. J. Metcalfe, and A. C. Percy, London, and A. F. Hargreaves, Roulin. Eng. Pat. 20,965, Sept. 30, 1903.

A SAFETY non-detonating explosive which yields when exploded a large proportion of carbon monoxide together with non-inflammable gases, in such proportion as to protect the carbon monoxide from the oxygen of the atmosphere until its temperature has fallen within the safety limit. The explosive consists of two separate mixtures—(A) Saltpetre (75 per cent.), charcoal (22.5 per cent.), and sulphur (2.5 per cent.). (B) Paraffin wax (33 per cent.), and rice or maize starch (77 per cent.) which are blended together in the proportion of (A) (85—87.5 per cent.) to (B) (15—12.5 per cent.). Mixture (B) is prepared as follows:—Paraffin wax is melted and granulated starch added until the entire charge of molten wax is absorbed, thus rendering the starch granules harder, more coherent, and less susceptible to atmospheric influences. The two mixtures are then blended and pressed into a compact pellet.—G. W. McD.

Fuses; Means for Igniting — W. Reine, Quartz Mountain, U.S.A. Eng. Pat. 12,238, May 30, 1904.

A device especially suitable for damp mines, in which a cap of conical shape (the apex being filled with sodium) is attached to the fuse end. On breaking the cap the sodium is ignited by the moisture in the atmosphere.—G. W. McD.

UNITED STATES PATENTS.

Powders; Apparatus for Measuring the Duration of Combustion of — A. Ciolfi. U.S. Pat. 764,350, July 5, 1904. XXIII., next col.

"Smokeless" Gunpowder, and Method of Making same. W. H. Simpson, Peoria, Ill. U.S. Pat. 765,999, July 26, 1904.

A MIXTURE is made of potassium chlorate, 37 parts, and potassium ferrocyanide, 25 parts, with sufficient water to make a dough-like mass, to which are added a saturated ethereal solution of eight parts of flowers of sulphur, and 30 parts of tannic acid dissolved in "Columbian spirits." The mixture is granulated and dried.—E. S.

FRENCH PATENTS.

Guncotton; Method and Apparatus for Compressing Blocks of — G. W. Bell. Fr. Pat. 340,473, Feb. 16, 1904.

THE press block is mounted horizontally and is made in two parts, the upper being hinged to facilitate the introduction of the mould. The plungers work from opposite ends, and have a longitudinal motion independent of each other. It is claimed that a greater uniformity of density is thus obtained, and the pressure required is less than that usually necessary.—G. W. McD.

Nitrocellulose, Nitrohydrocellulose and Nitro-oxycellulose; Process for Manufacture of — Patronenfabrik, Saxonia. Fr. Pat. 340,527, Feb. 18, 1904.

SEE Eng. Pat. 5126, 1904; this J., 1904, 560.—G. W. McD.

Chlorate and Nitrate Explosives. E. Louis. Fr. Pat. 340,913, March 2, 1904.

THE following are given as examples of these explosives. Potassium chlorate (75—94 per cent.), potassium nitrate (0—15 per cent.), lard (0—10 per cent.), beef fat (0—14 per cent.), and mutton fat (0—18 per cent.), and also potassium chlorate (60—80 per cent.), potassium nitrate (0—20 per cent.), mononitronaphthalene (0—15 per cent.), mononitrobenzene (0—5 per cent.), dinitrobenzene (0—16 per cent.), rosin (0—15 per cent.), and lard (3—10 per cent.). The finely powdered dry chlorate and nitrate are incorporated with the melted fats and nitrohydrocarbons and the mass, after cooling, is broken up into grains of the desired size.—G. W. McD.

Explosive Mixture of Great Shattering Power. N. Ceipek. Fr. Pat. 341,021, March 1, 1904.

SMALL quantities of potassium nitrate and of picric acid are added to a mixture of ammonium nitrate and aniline nitrate in order to improve its keeping properties.—W. H. C.

XXIII.—ANALYTICAL CHEMISTRY.

APPARATUS, ETC.

UNITED STATES PATENTS.

Organically Contaminated Liquids [Sewage]; Apparatus for Testing — W. D. Scott-Moncrieff, London. U.S. Pat. 765,794, July 26, 1904.

SEE Eng. Pat. 18,061 of 1899; this J., 1900, 1032.—W. P. S.

Powders; Apparatus for Measuring the Duration of Combustion of — A. Ciolfi, Cleveland, U.S.A. U.S. Pat. 764,350, July 5, 1904.

A TIMING apparatus (consisting of a rotating drum on which a record is traced by means of a vibrating fork) is set in motion simultaneously with the electrical ignition of the powder, and similarly thrown out on completion of combustion.—G. W. McD.

FRENCH PATENT.

Cupels; Manufacture of — The Morgan Crucible Co., Ltd. Fr. Pat. 341,015, March 7, 1904.

SEE Eng. Pat. 1695 of 1904; this J., 1904, 623.—T. F. B.

INORGANIC—QUALITATIVE.

Gold; Microchemical Detection of — by means of Col-
loidal Coloration of Silk Fibre. J. Donau. Monatsh. f. Chem., 1904, 25, 545-554.

THE fact that various fibres become coloured purple when they are immersed in a gold solution has been long known. The author has determined the best conditions under which the phenomenon may be applied to the microchemical detection of gold. The best results are obtained by use of a silk fibre, which has been previously treated with stannous chloride and pyrogallol, a red coloration being produced with the gold solution. The fibre is preferably one which has been prepared from raw silk by from 2 to 4 hours treatment with about 10 per cent. caustic potash or soda solution followed by thorough washing with water. The fibre is then immersed for a considerable time in a stannous chloride solution containing a little pyrogallol, and then washed a few times with water and dried between filter-paper before being immersed in the solution of gold hydrogen chloride. The reaction is carried out in a way exactly similar to that used by Emich with litmus-silk (this J., 1901, 1142; 1902, 498); it is much more sensitive than the ordinary microchemical test for gold, and is especially useful for the detection of small quantities of gold in presence of large amounts of other substances. For this purpose the solution containing the gold, but no free chlorine, is treated with lead parings and slowly evaporated almost to dryness. The residue is treated with water, washed by decantation, and dissolved in *aqua regia*. The small amount of dissolved lead is precipitated by dilute sulphuric acid, the solution evaporated first on the water-bath and later on the sand-bath, till sulphuric acid is expelled, the residue taken up with water and tested for gold as described above. The reaction is not affected by the presence of magnesium, alkaline earths, aluminium, chromium, zinc, manganese, nickel, cobalt, mercuric, lead, bismuth, and copper salts. It is prevented by bases, concentrated mineral acids, arsenious, arsenic and silicic acids, tartar emetic and antimonates. Silver salts alone colour the silk fibre yellow, but this is covered by the red gold coloration and is also destroyed by treatment with nitric acid. Platinum salts in small proportions have no influence, but when present in excess colour the fibre black.—A. S.

Cerium Compounds; Study of some — [Detection of Iron in Presence of Cerium]. J. Sterba. XX., page 834.

INORGANIC—QUANTITATIVE.

Volumetric Analysis; Standard Substances for —, and **Iodometry.** F. Raschig. Z. angew. Chem., 1904, 17, 577-585. (See Higgins, this J., 1900, 958.)

THE author prefers hydrochloric acid, prepared by dissolving a known weight of the gas in water, to either oxalic

acid or sodium carbonate as a standardising substance. The method of preparation is as follows:—Place 90 c.c. of water in a 100 c.c. flask, provided with a bent capillary tube hanging over the neck and reaching close to the bottom. Weigh accurately: then place on one pan of a balance turning with a centigram, attach a 30 cm. length of narrow indiarubber tubing (cycle-tyre valve tubing) to the capillary and to a Kipp apparatus delivering hydrochloric acid gas, from the action on ammonium chloride of strong sulphuric acid; counterpoise the flask and contents; place 3.7 grms. weight on the other scale, and then admit hydrochloric acid gas till equilibrium is re-established. If the Kipp and its sulphuric acid wash-bottle had the air expelled before connecting, absorption takes place with practically no bubbling and no evaporation. Disconnect, cool the flask, and weigh flask and capillary accurately; this gives the exact weight of gas absorbed. Rinse the capillary into the flask, and make up to the calculated volume for N/1 acid (adding the quantity of water over 100 c.c. from a graduated pipette, or making use of a flask graduated on the neck between 100 and 110 c.c.). The acid so obtained is accurately normal, and its preparation requires no excessive skill in manipulation. By its help N/1 sodium hydroxide solution is standardised, and from this sulphuric acid and other acids.

A similar solution of sulphurous acid, made by passing sulphur dioxide from a siphon into water, serves to standardise iodine. This, however, must not be made stronger than N/20, or it loses sulphur dioxide readily, and even the N/20 solution requires some care and skill in its preparation. It loses no gas in half-an-hour or more, and can be measured and transferred by a pipette, but cannot be poured from one vessel to another without loss of at least 2 per cent. of its sulphur dioxide. To standardise iodine, place 25 c.c. of the nominally N/10 solution in a conical flask, plunge the point of a 50 c.c. pipette containing the sulphur dioxide solution, to the bottom, and let the contents slowly out, keeping the liquid in constant rotation. If exact, the yellow tint of the iodine just disappears with the last drop of the sulphurous acid. If not quite exact, a few drops of the N/10 thiosulphate or iodine solution, as the case may be, are added to the point of disappearance or re-appearance of the yellow tint, the solution is corrected accordingly, and re-standardised. With practice, there is no need to use starch as an indicator. If then, the colourless liquid from the iodine standardisation be titrated with N/10 sodium hydroxide it should require exactly 50 c.c., and we can thus check the iodine, standardised from the sulphurous acid solution, against the sodium hydroxide, standardised from the hydrochloric acid, and establish the correspondence of all these solutions. From the iodine, permanganate can now be standardised:—Exactly decolorise 25 c.c. of N/10 iodine by means of 50 c.c. of N/20 sulphurous acid. Add 25 c.c. of N/10 permanganate, and decolorise again:—Exactly 50 c.c. should be needed. Whilst, however, the author hopes his hydrochloric acid standardising may come into general use, he feels this is not likely to be the case with the sulphurous acid standard; the weighing of flask and contents (about 250 grms.), in order to get the exact weight of 0.32 gm. of sulphur dioxide, being undoubtedly a weak point.

The direct titration of sulphurous acid by sodium hydroxide is not very satisfactory. If phenolphthalein be used, a pink colour is struck when about 95 per cent. of the required soda has been added; though when neutralisation is complete, the sudden deepening of the red colour with the last drop is fairly conspicuous. If Methyl Orange be used, though the change from sulphurous acid to bisulphite is sharp, yet the titration is inexact, and more soda solution is required than corresponds to the sulphurous acid. This is due to oxidation; the bisulphite formed is acid to Methyl Orange, though the corresponding bisulphite would have been neutral. The author finds that sulphurous acid itself is very unsensitive to oxygen, but that at the moment of being converted into or being liberated from a sulphite it rapidly absorbs oxygen. This explains the fact that if, instead of treating sulphur dioxide solution with iodine and then titrating with sodium hydroxide, 20 c.c. of N/10 sulphur dioxide be very slowly introduced under 20 c.c. of

N/10 sodium hydroxide and then iodine be added, only 17 c.c. instead of 20 c.c. will be needed. That this is not due to loss by escape of gas is shown by the fact that the liquid now requires 17 c.c. of sodium hydroxide solution for neutralisation, a total of $20 + 17 = 37$ c.c., instead of $2 \times 17 = 34$ c.c. To this character, too, and partly to escape of gas, is due the fact that in titrating sulphurous acid with iodine, too low results are always obtained if the iodine be added to the sulphurous acid—neither Bunsen's explanation of this, nor that of Volhard, involving the separation of sulphur, being satisfactory.—J. T. D.

Indicators; Mixed — M. Scholtz. Z. Elektrochem., 1904, 10, 549–553.

When an acid is titrated with alkali in presence of two indicators, that indicator will be first affected, which is the stronger acid; in titrating with acid the converse holds good. Transition tints are thus produced just before neutralisation, and by this method the comparative strengths of numerous indicators, taken in pairs, have been ascertained. It is suggested that the results may help towards devising new volumetric methods.—W. A. C.

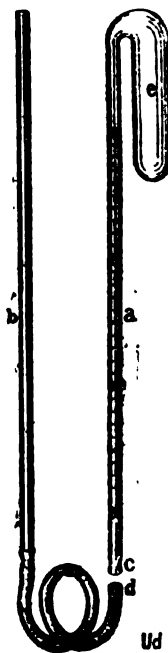
Carbon Dioxide; Determination of — in Crude Cement Powder. G. Sander. Thonind. Zeit., 1904, 28, 997–998.

The apparatus is designed to give a correct direct reading of the alterations in the volume of gas under fluctuations of temperature and pressure, so that the Dietrich-Frühling apparatus can be used without barometer or thermometer. The measuring tube *a* is widened at *e* so that the latter contains, up to the zero-mark *o*, exactly 100 c.c. (at 0° C. and 760 mm.). The tube *a* is graduated in one-fifths of 1 c.c. (total 30 c.c.), and is filled to the zero mark with mercury, balanced by the tube *b*. To set the apparatus, mercury is poured into the tube *a*, which is closed by the thumb and turned over to allow the mercury to escape until the surface coincides with the mark corresponding to the volume occupied by 100 c.c. of air at the prevailing temperature and pressure. The mercury is poured into a basin, and the air in *e* is moistened by introducing a drop of water which is then vaporised by heat, the open end of *a* being closed by the mercury tube *b*. When the air is re-cooled, the measured mercury is returned to *e*, and *e* is re-closed by the rubber tube attached to *b*, whereupon the apparatus is tilted to allow the mercury to run from *e* into *a*, leaving the standard volume of air in *e*. Assuming that 200 c.c. of carbon dioxide are furnished by 0.89388 gm. of calcium carbonate, then if the crude cement powder is to give 75 per cent. of carbonate (i.e., 150 c.c. of carbon dioxide), the volume of air recorded in the apparatus must be multiplied by 1.5, and from the result can be calculated the weight of calcium carbonate corresponding to the volume of gas formed in the Dietrich-Frühling test. The author has compiled a table of these weights at temperatures between 0° and 30° C.

In a modification of the apparatus the part *e* is turned upright, to form a direct continuation of the tube *a*, in order to facilitate the primary adjustment, the open end of *a* being dipped into a trough of mercury, and the rubber tubing attached whilst *a* is in this position.—C. S.

Lead Assay; Commercial Wet — H. A. Guess. Trans. Amer. Inst. Min. Eng., 1904.

The following methods are convenient for all lead determinations, but especially suitable for the assay of poor ores containing about 0.5 per cent. 1. The ore is dissolved in nitric acid and evaporated with sulphuric acid, water added,



the whole heated to dissolve soluble sulphates, the solution filtered, and the residue well washed. Filter and residue are now returned to the original flask, and digested with slightly acid ammonium acetate solution till all lead sulphate is dissolved. The liquid is diluted with water, and potassium chromate solution (9.396 grms. per litre) added in known quantity and slight excess. The solution is filtered and the residue washed free from chromate; the filtrate is acidified with 25 c.c. of hydrochloric acid (sp. gr. 1.1), a crystal of potassium iodide added, and the liberated iodine determined by titration with sodium thiosulphate solution (36 grms. of the pure crystallised salt to the litre. Half-strength, however, usually preferred) and starch. The liberated iodine affords a measure of the unused chromate, and hence of that used in precipitating the lead. The chromate solution and the stronger thiosulphate solution are equivalent per c.c. to 0.01 grm. of lead. The only substance which interferes with this process is antimony, which tends to prevent solution of the lead sulphate. If antimony be present, slightly ammoniacal ammonium acetate solution is used for the digestion, and is acidified after solution is complete, before diluting and precipitating with chromate. With much lead, the quantities of ammonium acetate solution and of water are not of moment; but with 1 per cent. or less, the strong ammonium acetate solution should not exceed 10 c.c., nor should the bulk after dilution exceed 50 c.c. A large excess of chromate hastens the completion of precipitation of these small quantities, but makes the subsequent washing tedious, and gives an objectionably large amount of chromate to titrate. Unless antimony be present, instead of back-titration, hot dilute hydrochloric acid may be poured, first into the precipitation-flask to dissolve any lead chromate contained in it, then through the filter (the funnel being placed in the neck of a clean flask) till all the lead chromate is dissolved; flask and filter are well washed with warm water, and the solution of lead chromate is titrated with iodide and thiosulphate. 2. This method is especially adapted for heavy lime-ores, in the case of which the previous method would be found tedious, on account of the large bulks of calcium sulphate to be washed:—To 1—5 grms. (according to richness) of the ore, in a 250 c.c. flask, add 3—5 c.c. of strong nitric acid and 15 c.c. of strong hydrochloric acid: heat till all is dissolved and the excess of acid has been reduced to about 8 c.c. Then add dilute ammonia till in slight excess, and afterwards excess of 80 per cent. acetic acid slowly, with vigorous shaking, and finally 5 c.c. of strong ammonium acetate solution. If antimony and gelatinous silica be absent, and the undissolved siliceous residue be slight, add excess of 10 per cent. potassium chromate solution to the hot undiluted liquid, shake, allow to settle for five minutes, filter, and wash free from soluble chromates. Place funnel in neck of original flask, dissolve lead chromate with hot hydrochloric acid, wash with water containing 0.5 per cent. of acetic acid and titrate the solution with iodide and thiosulphate solution as before. By using not too much iodide (0.5—2.0 grms.), and having say 50 c.c. of 1.1 hydrochloric acid in 300 c.c. of warm liquid, there is hardly any tendency for lead iodide to separate and obscure the reaction. This "short-cut" method gives good results in presence of most other metals; but interference may be caused by barium, if present as carbonate, for barium chromate is insoluble; the addition of 1—2 c.c. of 10 per cent. ammonium sulphate remedies this. Interference also occurs with bismuth, antimony, and silver, and then the first method should be used. Either of these methods is much to be preferred, in the case of poor ores, to the molybdate method (this J., 1893, 376), which is so generally used; for the end reaction in the molybdate method is not sharp, and may involve an error of 0.3—0.5 c.c. (= 3—5 mgrms. of lead), which, though permissible in a rich ore, may be as much as the total quantity of lead in a poor ore.—J. T. D.

Bismuth; Electrolytic Determination of —. A. Hollard and L. Bertiaux. *Comptes rend.*, 1904, 139, 366—367.

Separation from Copper.—To the solution of the sulphates containing not too great an excess of sulphuric acid, and heated to boiling, phosphoric acid is added in excess, and

the solution allowed to stand overnight, to complete the precipitation of the bismuth. The precipitate is filtered, washed with dilute phosphoric acid (1 vol. of acid of sp. gr. 1.711 diluted to 20 vols.) and finally, to remove the copper more readily, with a mixture of potassium cyanide and ammonium sulph-hydrate, 100 c.c. of which contain 5 grms. of cyanide and 5 c.c. of the sulph-hydrate obtained by saturating 10 per cent. ammonia with hydrogen sulphide. The bismuth phosphate is now dissolved in nitric acid diluted with an equal volume of water, and evaporated with 12 c.c. of sulphuric acid till thick white fumes are given off. The solution, which now contains the bismuth as pyrophosphate, is diluted to 300 c.c., and the liquid electrolysed with a current of 0.1 ampère, for 24 hours. The deposited bismuth should be free from copper, but should it contain any, the copper can be estimated colorimetrically, and its amount deducted.

Separation from Lead.—The solution of the nitrates is evaporated with 12 c.c. of sulphuric acid, together with the quantity equivalent (approximately) to the contained metals, till thick white fumes appear. Allow to cool, dilute with water to 300 c.c., add 85 c.c. of absolute alcohol and electrolyse with a current of 0.1 ampère for 48 hours. Very small amounts of bismuth can in this way be accurately separated from large amounts of lead; the deposited bismuth is absolutely free from lead.—J. T. D.

Manganese; Electrolytic Determination of —.

J. Köster. *Z. Elektrochem.*, 1904, 10, [31], 553—554.

It has been hitherto found impossible to deposit manganese peroxide coherently under a rotating cathode. The author succeeds by adding 10 grms. of ammonium acetate and 10 c.c. of 96 per cent. alcohol to the electrolyte (which must be free from chlorides) and using a roughened dish of platinum-iridium. The temperature must be kept at 75°—85° C. A current density of 4 ampères per sq. dem. may be applied.—W. A. C.

Thorium from Cerium, Lanthanum and Didymium; Separation of — by *Metanitrobenzoic Acid*. A. C. Neish. *J. Amer. Chem. Soc.*, 1904, 26, 780—793.

THE method is based on the fact that metanitrobenzoic acid precipitates thorium from a neutral solution of the nitrate as $\text{Th}(\text{C}_6\text{H}_4\text{NO}_2\text{CO}_2)_4$. Thus, on treating 25 c.c. of a solution containing an amount of thorium equivalent to 0.1128 grm. of thorium oxide, with about 150 c.c. of a 0.35 to 0.4 per cent. solution of the acid at 80° C., and keeping the beaker at 60° to 80° C. for 15 minutes, a bulky precipitate is deposited which, after being washed with a 5 per cent. solution of the precipitating acid and ignited in a platinum crucible, leaves the quantitative amount of thorium oxide. For the ignition the filter paper should be placed whilst still moist in the uncovered crucible, and heated first in the Bunsen flame, and then for 15 minutes in the blast flame. For the complete separation of thorium from cerium, &c., reprecipitation is necessary. For this purpose the precipitate is dissolved off the paper by means of hot dilute nitric acid (1:5), the paper well washed with hot water, and the solution diluted to about 150 c.c. and treated with 25 c.c. of the *m*-nitrobenzoic acid solution. Sufficient Methyl Orange to give a decided red tint to the liquid is now added, and dilute ammonia solution (1:10) run in until the colour changes to pink, the liquid being thoroughly stirred after each addition. Care must be taken not to continue the neutralisation until the liquid becomes yellow, or the other earths will be reprecipitated. To insure complete precipitation of the thorium compound an additional 50 c.c. of the reagent are now added, the beaker heated on the water-bath as before, the precipitate collected, washed, dissolved in dilute nitric acid, and once more precipitated, before final ignition. *m*-Nitrobenzoic acid gives no precipitate with glucinum, gadolinium, yttrium, titanium, and samarium; zirconium gives a white opalescence and precipitate which increases on heating; whilst erbium gives a white curdy precipitate. Mercurous and mercuric nitrate give heavy curd-like precipitates which dissolve on heating.

Analysis of Monazite Sand.—2 grms. of the sand in a fine state of division are mixed with 10 to 15 c.c. of concen-

trated sulphuric acid in a porcelain crucible which is gradually heated on a plate until the excess of acid has evaporated. More acid is then added, the contents stirred, and digestion continued for three hours, after which time the phosphates are converted into sulphates. The crucible is now cooled in ice water and the mass introduced drop by drop into 600 c.c. of water also cooled to 0° C., the crucible itself being finally placed in the beaker and left over night. The solution is heated to boiling, and treated with a boiling solution of oxalic acid (saturated in the cold), which is added in large excess with constant stirring. The white crystalline precipitate that separates on cooling, consisting of thorium, cerium, lanthanum, and didymium oxalates, is collected and washed with a dilute solution of oxalic acid, after it has stood for several hours. The filter paper containing the precipitate is returned to the same beaker and boiled with 10 to 15 grms. of potassium hydroxide and 25 to 50 c.c. of water, and the resulting hydroxides filtered off from the liquid which has previously been diluted to about 300 c.c. The precipitate is washed free from alkali and dissolved in hot dilute nitric acid (1 : 5), the solution evaporated to dryness on the water-bath, and the residue moistened with water and evaporated until free from all traces of free nitric acid. The nitrates are dissolved in 500 to 600 c.c. of water, 150 to 250 c.c. of the solution of *m*-nitrobenzoic acid slowly introduced with constant stirring, and the liquid heated at 60° to 80° C., and filtered from the precipitate, which is dissolved in dilute nitric acid, reprecipitated, and ignited whilst moist as described above. A pure white thorium oxide is more readily obtained by neutralising the solution of the thorium *m*-nitrobenzoate with potassium hydroxide instead of with ammonia, a slight excess of the reagent converting the flocculent *m*-nitrobenzoate first reprecipitated into the more compact hydroxide.—C. A. M.

ORGANIC—QUALITATIVE.

Beeswax; Detection of Artificial Colouring Matter in — P. Lemaire. Bull. Soc. Pharm. de Bordeaux, 1904, 44, 182—182.

A small fragment of the wax is dissolved in chloroform, and two or three drops of hydrochloric acid are added to the solution. The production of a rose-red colour indicates artificial colouring matter. Another portion is saponified by boiling with caustic soda solution, then treated hot with excess of hydrochloric acid. If a fugitive rose-red colour be obtained, which turns green on adding excess of ammonia, the wax is artificially coloured. Another piece of

the wax is melted in a capsule with saturated boric acid solution; on evaporating to dryness the residue acquires a reddish colour with wax containing added colouring matter.

—J. O. B.

Gum Acacia; Detection of — in Powdered Tragacanth. E. Payet. Rep. Pharm., 1904, 16, 301.

TRAGACANTH does not, like acacia, contain an oxydase capable of giving a brown colour with guaiacol in the presence of hydrogen peroxide. This reaction, therefore, enables the fraudulent admixture of gum acacia to be detected in powdered gum tragacanth. A 5 per cent. solution of the suspected gum is prepared with cold water; to this is added an equal volume of 1 per cent. aqueous solution of guaiacol, and one drop of hydrogen peroxide; on agitating the mixture and allowing it to stand, a brown colour is rapidly developed if gum acacia be present, whilst, if the tragacanth be pure, the mucilage remains perfectly colourless.—J. O. B.

Glycerides; Solutions of — in Acetic Acid [Distinction between Butter and Margarine]. L. Hoton. Bull. Soc. Chim. Belg., 1904, 18, 147—165.

When a solution of acetic acid in a fat is chilled, there is a separation into two layers, the upper of which may be regarded as fat + acid and the lower as acid + fat. In the case of butter, the glycerides dissolved first, are those with low critical temperatures of solution, low melting points, and low refractive indices. In the case of other fats and oils, however, those portions with high refractive indices are the first to pass into solution. On these facts the following analytical method is based:—5 grms. of the melted filtered butter-fat are mixed with 10 c.c. of acetic acid (sp. gr. 1.057) in a tube (16 mm. in diameter, graduated in mm.), which is heated to 60° C., with occasional agitation, in the water-bath. The contents are then cooled to 40° C., and the height of the upper layer measured. As soon as the temperature falls to 35° C., the lower layer is decanted into a weighed flat dish, and evaporated at about 70° C. until constant in weight (= Extract A). The portion left in the tube is mixed with a fresh 10 c.c. of acetic acid, and treated in the same way as the original fat, yielding Extract B and a residue C, which is also dried and weighed. The critical temperature of solution, Valenta test, and refractive index of each of the three fractions is then determined, and conclusions drawn from the ratio in which they stand to one another.

The following table shows representative results given by pure butter and different raw materials of margarine:—

Fraction.	Butter.			Oleomargarine.			Neutral Lard.		
	Centigrms.	Critical Temp. of Solution.	Valenta Figures.	Centigrms.	Critical Temp. of Solution.	Refraction at 40° C.	Centigrms.	Critical Temp. of Solution.	Refraction at 40° C.
		° C.	° C.		° C.			° C.	
A.....	109	48	39	30	72	49.8	31	63	50.5
B.....	182	49	43	48	74	49.5	50	67	49.7
C.....	193	57	55	423	80	49.0	420	78	49.3

Fraction.	Crude Cottonseed Oil.			Arachis Oil.			Sesamé Oil.		
	Centigrms.	Critical Temp. of Solution.	Refraction at 40° C.	Centigrms.	Critical Temp. of Solution.	Refraction at 40° C.	Centigrms.	Critical Temp. of Solution.	Refraction at 40° C.
		° C.			° C.			° C.	
A.....	65	52	68.0	42	57	59.0	53	60	62.7
B.....	70	54	68.2	68	67	58.8	65	67	59.3
C.....	360	70	59.2	395	73	56.0	370	77	57.0

The solubility of butter-fat in acetic acid is independent of the proportion of volatile acids present. In the author's opinion the most important factor is the difference between the critical temperatures of solution of the fractions C and A. Thus 11 samples of pure butter-fat gave on the

average 11.5 for values of C—A, whilst butter-fats containing 10 to 20 per cent. of margarine gave an average of 15.5. In like manner the mean difference between the Valenta numbers of C and A was 22 for the pure butter-fats and 27 for the adulterated butter-fats. On the other hand, certain

pure butter fats gave figures for the critical temperatures of C—A as high as those containing 10 to 15 per cent. of margarine, so that the method by itself does not furnish proof of adulteration. The author considers, however, it may be of great service in the case of butter-fats having a Reichert-Meissl value of 23 to 27, and when such samples give a value of less than 11 for the critical temperatures (C—A), they may be regarded as pure. There is a concentration of margarine in the fractions, the quantities of a mixture dissolved by acetic acid not being proportional to the coefficients of solubility of butter and other fats in that mixture.—C. A. M.

ORGANIC—QUANTITATIVE.

Incineration of Organic Matter facilitated by the use of Pumice Stone —. Duyk. Ann. Chim. anal. appl., 1904, 9, 252—254.

COARSELY powdered, recently calcined pumice stone, mixed in equal weight with the solid extractive to be incinerated, is recommended to facilitate the burning off of organic matter. By its aid a perfect ash is readily obtained with the most refractory nitrogenous substances, such as albumin, wool, or yeast, which are notoriously difficult to incinerate completely by ordinary methods.—J. O. B.

Methyl Alcohol; Determination of — in the Products of the Distillation of Wood. M. J. Stritar and H. Zeidler. Z. anal. Chem., 1904, 43, 387—400.

THE authors employ the iodide method for this purpose and use an apparatus similar to that described by Zeisel and Fanto for the determination of glycerin (this J., 1902, 993). The reaction between the methyl alcohol and the hydriodic acid (sp. gr. 1.70) is allowed to take place directly in the apparatus, and not in a closed tube.

Crude Wood Spirit.—5 c.c. are measured out in a pipette (the weight of the volume delivered being previously ascertained) and diluted to 500 c.c. This solution is used for the determination.

Crude Dilute Wood Spirit.—10 c.c. are diluted with about 40 c.c. of water and shaken with 0.5 gm. of animal charcoal for 15 minutes. The mixture is then filtered and the filter washed with water until the filtrate measures 100 c.c.

Crude Wood Acid.—50 c.c. are neutralised with sodium carbonate, diluted to 250 c.c. and filtered. 100 c.c. of the dark coloured filtrate are then rendered alkaline with sodium hydroxide and distilled. 50 c.c. of distillate are collected, treated with animal charcoal, and the determination proceeded with.

With regard to the influence of other substances in these distillation products, only allyl alcohol and esters greatly interfere with the results. The first is separately determined by the bromine method and allowed for, whilst the quantity of esters in the sample is obtained from a determination of the ester value.—W. P. S.

Methyl Alcohol in Commercial Formaldehyde; Determination of —. M. J. Stritar. Zeits. anal. Chem., 1904, 43, 401—402.

FIVE c.c. of the formaldehyde solution are diluted with 100 c.c. of water, an excess of ammonia added, and the mixture distilled. Fifty c.c. of distillate are collected, made slightly acid with acetic acid and diluted to 100 c.c. The methyl alcohol is then determined by the iodide (Zeisel) method as modified by the author. The small quantities of formaldehyde found in the distillate, do not affect the result.

—W. P. S.

Unsaponifiable Matter in Oils and Fats [Determination of] —. J. Huwart. Les Corps gras ind., 1904, 30, 194—195, 210—211, 228—229, 242—243, 258—259, 274—275, 290—291, 306—307, 322—323. Chem. Centr., 1904, 2, 158—159.

According to the author the usual methods for the determination of the unsaponifiable matter in oils and fats are all inaccurate. The following method is recommended:—5 grms. of the oil or fat are boiled for at least $\frac{1}{2}$ hour with 10 c.c. of a 20 per cent. alcoholic caustic potash solution

under a reflux condenser, and N/1 hydrochloric acid is then added until the liquid is nearly neutral. The liquid soap whilst still warm is transferred to a separating funnel, the flask being rinsed several times with 35 c.c. of warm water; 15 c.c. of glycerin of sp. gr. 1.26, are added, and the whole well shaken, and extracted with 50 c.c. of ether. The aqueous layer is separated, and again extracted with ether. The combined extracts are distilled to a small bulk, and the residue treated with 1 drop of phenolphthalein solution and a few drops of a 3 per cent. alcoholic caustic potash solution, and a few grms. of finely-broken glass added. The remainder of the ether is then distilled off, the residue dried for 2—2½ hours at 95°—100° C., and then treated with 45—50 c.c. of anhydrous ether or light petroleum spirit (b. pt., below 80° C.). After 12 hours, the solution is filtered, the residue washed several times with ether, the filtrate and washings are evaporated very slowly, and the residue is dried for 1½—2½ hours at 100° C. The author obtained the following results with this method:—Oil from *Lotta molva*, 1.02—1.07; oil from *Merlangus virens*, 0.88—0.09; oil from *Clupea sprattus*, 1.362; oil from *Lanina carnubica*, 1.51—1.66; olive oil, 0.7—0.8; pure butter fat, 0.33—0.44; and margarine fat, 0.65 per cent. The unsaponifiable matter consisted for the most part (75—85 per cent.) of cholesterol, which was determined by converting it into its acetic ester, and determining the combined acetic acid in the latter.—A. S.

Halogen Absorption of Oils; Comparison of the Hübl, Wijs, Hanus, and McIlhenny Methods of Determining the —. L. M. Tolman. J. Amer. Chem. Soc., 1904, 26, 826—837. (See also Archbutt and Harvey, this J., 1902, 1437—1439.)

THE author's experiments have led him to the conclusion that the results obtained by the methods of Wijs and Hanus are more reliable than the Hübl values. The solution of Hanus is readily prepared, and gives results agreeing more closely with current figures, but for rapid absorption an excess of 60 to 70 per cent. is required. In the case of Wijs' solution an excess of 35 per cent. is sufficient, but the results are higher. With either method 80 minutes is a sufficient time for complete absorption, though Wijs' method is about three times as rapid. The solution of Hanus is less affected by light than the other solutions. Acetic acid is a more suitable solvent for the active agent than carbon tetrachloride, which gives unsatisfactory results in ordinary work. If, however, the amount of substitution is to be determined, a solution of iodine chloride in carbon tetrachloride is the best reagent. For instance, in the case of rosin oil the following iodine values were obtained after 30 minutes:—

	Total.	Addition.	Substitution.
Iodine chloride in carbon tetrachloride.....	257.0	5.46	125.7
Iodine bromide in carbon tetrachloride.....	190.8	24.50	83.8
Bromine.....	257.0	5.46	125.7

—C. A. M.

Glycerol; Notes on the Determination of —. [Bichromate Method.] Taurel. Monit. Scient., 1904, 18, 574—577.

SEVERAL details are mentioned, the observance of which is considered to be necessary in order to obtain correct results by this method. In the first place, the glycerin should be carefully neutralised before precipitating the impurities with lead solution. The latter should consist of a solution of di-basic lead acetate or a mixture of sesqui-basic and di-basic lead acetate. Any excess of the latter added, must be removed before adding the chromic acid solution. It is preferable to carry out the oxidation in a flask attached to a reflux condenser.—W. P. S.

Chromed Hide-Powder Question. F. Kopecky. XIV., page 830.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Diamond; Action of Radium Emanations on — Sir W. Crookes. Proc. Roy. Soc., 1904, 74, 47—49.

It has previously been shown that when diamonds are exposed to the impact of radiant matter in a high vacuum, they exhibit phosphorescence of different hues, and assume a dark colour, owing to the formation of a coating of graphite. The author selected two Bingara diamonds, A and B, weighing respectively 0.960 and 1.020 grains; and of the same very pale yellow "off colour." B was kept first for a fortnight, and then for a further six weeks, close to a quartz tube containing about 15 mgrms. of pure radium bromide sealed in *vacuo*; it phosphoresced brightly and continued to glow the whole time of the experiment. At the end, no appreciable difference in colour between the two diamonds could be detected. B was then kept for 73 days in direct contact with radium bromide, at the end of which period, it was distinctly darker than A and had a bluish-green tint. After removing the graphite from B by treatment with nitric acid and potassium chlorate, the two diamonds were equally bright and transparent, but B had a pale bluish-green colour. This alteration of colour may be of commercial importance. It was found that the diamond B was strongly radio-active after it had been removed from the radium bromide for 35 days, during 10 of which it was being heated in the mixture of nitric acid and potassium chlorate, to remove its outer skin of graphite.—A. S.

Photochemical Reactions in a Homogeneous System; Reversible — I. Anthracene and Di-Anthracene. R. Luther and F. Weigert. Sitzungsber. Kgl. pr. Acad. Wiss., Berlin, 1904, 828—839. Chem. Centr., 1904, 2, 117.

UNDER the influence of sunlight, anthracene in solution, as observed by Fritzsche, and also, according to the authors, in the solid condition and as vapour, changes into dianthracene which, in the dark, is again converted into anthracene. The transformation is especially rapid under the action of light from a mercury vapour electric lamp. The conversion of dianthracene into anthracene in the dark, is complete; but, in the case of the reverse reaction in the light, a condition of equilibrium is finally attained, the proportions of the two compounds depending upon various factors, such as the nature of the solvent and of the source of light, the intensity of the light, the surface illuminated, the volume of the solution, &c. The reactive power of anthracene is considerably increased under the influence of light, *e.g.*, when exposed to light, anthracene is oxidised by the air with the production of a yellow coloration.—A. S.

Diphenylcarbonic Ester; Action of a Trace of some Salts and of Caustic Alkali on — R. Fosse. Comptes rend., 1904, 139, 141—143.

THE author has previously shown that diphenyl carbonate, when heated with a small quantity of dry sodium carbonate, decomposes with formation of carbon dioxide, phenol, and phenyl-*o*-phenoxybenzoate, in accordance with the equation: $2(C_6H_5)_2CO_3 = CO_2 + C_6H_5OH + C_6H_5(CO_2C_6H_5)(OC_6H_5)$. He now finds that small quantities of trisodium phosphate, disodium arsenate, sodium bi- and tetraborate, di- and monosodium salicylate, sodium ethylate, sodium hydroxide, and potassium hydroxide are also capable of causing this decomposition.—A. S.

Enzymes; Study of the Instability of — K. Aso. Bull. Coll. Agric., Tokyo, 6, 57—75. Chem. Centr., 1904, 2, 79.

IN order to elucidate the nature of the labile groups present in enzymes, the author studied the action of cyanogen, nitrous and nitric acids, hydrazine, methylhydrazine, and hydroxylamine on different enzymes. It was found that: (1) The activity of enzymes is not destroyed in very dilute solutions by small quantities of cyanogen; this is a further essential difference in the behaviour of living protoplasm and that of enzymes. (2) Very dilute nitrous acid has a greater destructive action on the activity of enzymes than nitric acid of the same concentration. (3) Hydrazine,

methylhydrazine, and hydroxylamine in dilute neutral solutions destroy the activity of enzymes. The behaviour of the enzymes can be best explained if the active groups are aldehyde or ketone groups. (See also this J., 1904, 687.)—A. S.

New Books.

DAS PHOTOGRAPHIEREN MIT FILMS. "PHOTOGRAPHISCHE BIBLIOTHEK," Bd. II. Dr. E. HOLM. Gustav Schmidt's Verlag, Berlin, W., 10. 1904. Price M. 1.20.

8vo volume, containing 64 pages of subject-matter and a table of contents. The pages are illustrated with 51 engravings, and the subject is treated under the following heads:—A. Functions and Varieties of Films. Ordinary and Orthochromatic Films, and Films for Tricolour Photography. Celluloid, Paper, and Gelatin Films. B. Advantages and Drawbacks in Films as opposed to Glass Plates. I. Advantages of Films. II. Disadvantages. C. Preparation of Films. (i.) Mechanical Preparation, &c. (ii.) Exposure. (iii.) Development. (iv.) Further Treatment of Films. (v.) Different kinds of Film-Cameras, &c.

ELECTRO-CHEMISTRY. PART I. GENERAL THEORY. By R. A. LEHFELDT, D.Sc., Professor of Physics at the East London Technical College. Including a chapter on the Relation of Chemical Constitution to Conductivity. By T. S. MOORE, B.A., B.Sc., Lecturer in the University of Birmingham. Longmans, Green, and Co., 30, Paternoster Row, London, E.C.; also New York and Bombay. 1904. Price 5s.

8vo volume, containing 260 pages of subject-matter, with 55 illustrations. Pages 255—260 are devoted to tables, pages 261—268 to alphabetical indexes of names of authors, &c., and subjects. The subject-matter is treated under the following arrangement:—I. (R. A. Lehfeldt) Mechanism of Conduction in Electrolytes. II. (T. S. Moore) Relation of Chemical Constitution to Conductivity. III. (R. A. Lehfeldt) Theory of Chemico-Electromotive Force.

Trade Report.

I.—GENERAL.

NATIONAL BUREAU OF STANDARDS, U.S.A.: ANNUAL REPORT OF THE DIRECTOR OF THE — FOR THE FISCAL YEAR ENDED JUNE 30, 1903.

Government Printing Office, Washington, U.S.A.

The Office of Standard Weights and Measures of the Treasury Department was, on July 1, 1901, in pursuance of an Act of Congress approved March 3, 1901, superseded by the Bureau of Standards. On July 1, 1903, a Department of Commerce and Labour was established, to which the Bureau was transferred. The functions of the Bureau of Standards are as follows:—The custody of the standards; the comparison of the standards used in scientific investigations, engineering, manufacturing, commerce, and educational institutions, with the standards adopted or recognised by the Government; the construction, when necessary, of standards, their multiples, and subdivisions; the testing and calibration of standard measuring apparatus; the solution of problems which arise in connection with standards; the determination of physical constants and properties of materials. The Bureau will also furnish such information concerning standards, methods of measurement, physical constants, and the properties of materials as may be at its disposal. For all comparisons, calibrations, tests, or investigations, except those performed for the Government of the United States or State Governments, reasonable fees will be charged.

In the Annual Report of the Director, detailed descriptions of the various departments of the Bureau and of their equipment are given. The number and value of the tests completed during the fiscal year ended June 30, 1903, are given in the following table:—

Nature of Test.	For Government.		For Public.		Total.	
	No.	Value.	No.	Value.	No.	Value.
Length	368	Dols. 130'90	111	Dols. 153'55	479	Dols. 284'45
Weight	291	345'00	109	100'25	400	445'25
Capacity	294	173'75	10	6'75	304	180'50
Photometry	1	2'50	..	..	1	2'50
Temperature	284	220'63	115	40'19	399	260'82
Electrical	15	71'00	56	173'50	69	245'50
Sandry	10	40'00	4	2'10	14	42'10
Total	1,261	983'78	405	455'34	1,666	1,439'12

	Dols.
Fees received, 1902-3	488'99
Fees for tests not completed during 1902-3	33'65
Fees for tests completed, 1902-3	455'34

Accompanying the report are seven Bureau circulars dealing with: (1) Verification of Standards and Measuring Instruments; (2) Verification of Metal Tapes; (3) Verification of Standards of Mass; (4) Verification of Standards of Capacity; (5) Testing of Clinical Thermometers; (6) Verification of Electrical Standards and Measuring Instruments; (7) Pyrometer Testing and Heat Measurements.

—A. S.

FEDERATED MALAY STATES; EXPORTS OF THE — IN 1903.

Bd. of Trade J., Aug. 4, 1904.

Tin and tin ore contributed 71½ million dols. to the exports, an increase of 14½ per cent. in value and of 7 per cent. in quantity of tin, and over 10½ per cent. in that of tin in ore. Pahang sent out an increase of 2,000 piculs of tin (25,275 against 23,114 piculs). Gold bullion from Pahang fell to 12,441 oz., representing a value of 565,866 dols., a decrease of 7,113 oz. and of 170,000 dols., but the export from Negri Sembilan rose from 199 oz. in 1902 to 2,370 oz. in 1903, and in value from 7,000 dols. to 98,000 dols. Sugar, almost entirely from Perak, amounted to 391,595 piculs, valued at 1,807,679 dols., a decrease in quantity but an increase in value, as compared with the figures for the previous year, which were 421,880 piculs and 1,705,504 dols.

Rubber was exported from Negri Sembilan to the value of 250 dols. in 1902, and 3,713 dols. in 1903. Gambier exports reached 386,675 dols., a decrease of some 25,000 dols. in value and of 3,000 piculs in quantity; the decrease occurred in Negri Sembilan. Jungle guttas of all kinds rose in value from 41,000 dols. to 68,000 dols., and in quantity from 531 to 625 piculs, Pahang alone contributing to the extent of 53,000 dols., an advance of 19,000 dols., and Selangor having a trade of 13,000 dols. compared with less than 1,000 dols. in 1902.

LYONS (FRANCE); CHEMICAL INDUSTRY IN —.

Foreign Office Annual Series, No. 3243.

The following table shows the consumption of pyrites in Lyons in 1901-3:—

	1901.	1902.	1903.
	Tons.	Tons.	Tons.
Production of mines of St. Bel	307,000	315,000	320,000
Export	53,000	64,000	117,000
	254,000	251,000	203,000
Import of pyrites	205,000	171,000	205,000
Consumption	459,000	422,000	408,000

The consumption of pyrites, and consequently the production of sulphuric acid, has decreased slightly. The manufacture of "concentrated" sulphuric acid, begun in 1902 at Lyons by the Volta company, continued in 1903.

The glue and gelatin trade suffered from over-production. The general industrial crisis throughout France prevented the French industry from absorbing the surplus production, nor has production lagged behind in other countries; the import into France also increased from 1,993 tons in 1902 to 2,428 tons in 1903. The increase in export from 7,794 tons in 1902 to 7,948 tons in 1903 did not suffice to relieve the congestion of the market, and a considerable fall in prices resulted. The activity of the bone manure industry, on the other hand, keeping up the price of raw material, placed the glue and gelatin industries in an abnormal position. This brought about an appeal from the manufacturers for a higher protective tariff, which was granted, it being fixed at 11 fr. per 100 kilos. general tariff, and 7 fr. 50 c. per 100 kilos. minimum tariff.

Reduction in the output of phosphorus was general in 1903. The consumption is stationary and the activity of the factories is dependent on the export demand. The export of white phosphorus fell from 89½ tons in 1902 to 61½ tons in 1903, whilst red phosphorus increased from 48½ to 65½ tons for the same period.

The consumption of stearins and soap was as follows:—1884, 30,500 tons; 1900, 28,000; 1901, 25,750; 1902, 25,400; 1903, 24,500. The export is maintained, but does not counterbalance the decrease of consumption in France itself. The export of candles during the last three years was as follows:—1901, 4,402 tons; 1902, 4,348; 1903, 4,881. Small factories are gradually disappearing.

There are two manufacturing factories at Lyons for turning out rubber goods. The factory at Lacollonge has produced a new article—hardened imitation rubber—at a cost far below ordinary hardened rubber. A curious economic phenomenon has taken place of late years in the French rubber industry. Bordeaux has recently taken the place of Antwerp as the rubber market for France. The figures showing the imports into Bordeaux are as follows:—1898, 89 tons; 1899, 175; 1900, 239; 1901, 235; 1902, 678; 1903, 1,113.

The consumption of indiarubber both at Clermont-Ferrand and at Lyons for electrical machines, and for tyres for automobiles and bicycles, has brought these cities to form new commercial connections.

MADAGASCAR; TRADE OF — IN 1903.

Bd. of Trade J., Aug. 4, 1904.

Below are given the values of certain articles exported from Madagascar in 1903. The figures in brackets are those for 1902:—Gold, 5,856,778 fr. (4,123,613 fr.); rubber, 2,581,439 fr. (645,630 fr.); hides, 1,214,686 fr. (734,890 fr.); wax, 556,018 fr. (789,519 fr.).

VII.—ACIDS, ALKALIS, Etc.

SULPHUR TRADE OF SICILY.

Bd. of Trade J., Aug. 4, 1904.

The exports of sulphur from Sicily during the 12 months ended June 30, 1904, amounted to 505,629 tons, as compared with 484,850 tons in the similar period of 1902-3.

The stock of sulphur remaining in Sicily at the end of June last was 278,025 tons, as compared with 287,878 tons and 276,589 tons respectively on the same date in 1903 and 1902.

X.—METALLURGY.

NEW SOUTH WALES; MINERAL PRODUCTION OF —

Bd. of Trade J., Aug. 4, 1904.

According to the annual report of the Department of Mines, New South Wales, the value of the mineral production of the State for the year 1903 was 6,059,486l., this being a net increase of 421,841l. over that of the previous year (see this J., 1903, 767). All the principal minerals show satisfactory increases in value.

The production of gold from ores, &c. mined in the State during 1903 was 295,776 oz. crude (equal to 254,260 oz. fine), valued at 1,080,029*l.*, as compared with 190,316 oz. crude (equal to 161,255 oz. fine), valued at 684,970*l.*, for the preceding year. A statement of the yield obtained by dredges during the past four years shows an increase from 8,882 oz. in 1900 to 27,238 oz. in 1903. The chief centre of the gold dredging operations is in the Araluen division. There were fourteen plants at work there at the close of the year, and they contributed 53 per cent. of the value of the yield obtained by this branch of the industry.

The total quantity of coal produced in New South Wales to the end of 1903 is estimated at 109,741,916 tons, valued at 44,021,103*l.* The production for 1903 was 6,354,846 tons, valued at 2,319,660*l.*, as compared with 5,942,011 tons, valued at 2,206,598*l.* for the previous year.

The total production of kerosene shale for 1903 was 34,776 tons, valued at 28,617*l.*, this being a decrease of 28,104 tons, and 31,100*l.* in value, on that of the previous year.

The estimated net value of silver, silver-lead, concentrates, ores, &c. for 1903 was 1,501,403*l.*, and with lead and zinc added, the total value was 1,626,576*l.*, or an increase of 128,114*l.* in the value of the output as compared with the previous year.

From ores raised in the State during the year, the value of the copper produced was 431,186*l.*, as compared with 308,923*l.* for the previous year. The quantity of tin ore obtained by the dredges during the year amounted to 244 tons, valued at 20,100*l.*

At the close of the year there were six plants equipped primarily for saving tin at work, while three dredges were saving tin as well as gold. Several additional plants were on the point of starting operations, and others were in the course of construction. The output of tin ore during the year 1904 is therefore likely to be largely augmented from this source.

MANGANESE ORE INDUSTRY OF RUSSIA.

Foreign Office Annual Series, No. 3206.

The following figures show the quantities of manganese ore exported from Batoum during the year 1903 to the countries named:—Russia, 53,420 tons; Netherlands, 50,900 tons; Belgium, 5,125 tons; total, 109,445 tons.

The stock of manganese ore at Tchiatouri at the end of 1903 was over 323,000 tons, mostly of good quality, and the market prices varied from 6 to 7 kopeks per pound (1*½*d. to 2*d.* per 36 English lb.), less an allowance of 15 to 20 per cent. on the weight for waste. Steamers are loaded almost entirely at Poti from waggons coming direct from Tchiatouri.

MINERALS IN BARCELONA (SPAIN).

Foreign Office Annual Series, No. 3237.

Further progress has been made in the working of the arsenic and galena mines, from which, during the year, 6,982 tons of arsenical pyrites were sent to the smelting works at Badalona, producing 2,350 tons of white arsenic which, with the exception of 43 tons, was exported at a very profitable price.

The past year has seen the first shipment of iron ore from a mine in Catalonia, a British firm having shipped at Culera (a small port near Port Bou) 2,200 tons of iron ore, proceeding from the mines of Celra, in the province of Gerona, for Newport, Mon.

XII.—FATS, FATTY OILS, Etc.

OLIVE OIL; PRODUCTION OF — IN SPAIN.

Monit. Offic. du Commerce. Bd. of Trade J., Aug. 4, 1904.

In 1903, the area of land devoted to the cultivation of olives amounted to 1,333,303 hectares,* an increase of 173,042 hectares over the average for the last 10 years. The production, however, shows a decrease, being 1,975,803

quintals, as compared with an average of 2,195,743 quintals during the last 10 years.

A large portion of the oil produced is consumed in Spain; the remainder is sent to France, chiefly to Nice, Aix, and Salon, where it is refined and mixed with oil produced in Provence, consumed in France, or exported to other countries.

XIII. A.—PIGMENTS, PAINTS, Etc.

SIENNA; BURNT ITALIAN — : U.S. CUSTOMS DECISION.

July 18, 1904.

Burnt sienna earth, showing on analysis water 9.80 per cent., iron oxide 82.75, and alumina, silica, and sulphates 7.45 per cent., was assessed for duty at 30 per cent. *ad valorem*, as a "colour," under paragraph 58 of the present tariff. The Board of General Appraisers overruled this action, and sustained the claim of the importer that it was properly dutiable at $\frac{3}{4}$ cent per lb., under paragraph 49, as "sienna, washed, powdered, or pulverised," on the ground that the evidence showed it to be sienna, and that there was no recognised dividing line between sienna earth and iron oxide.—R. W. M.

XIII. B.—RESINS, VARNISHES, Etc.

WOOD TURPENTINE; MANUFACTURE OF — IN SAVANNAH, U.S.A.

Foreign Office Annual Series, No. 3240, Aug. 1904.

"Wood turpentine," that is, a somewhat inferior quality of spirit of turpentine, is now being manufactured in the Southern States from pine knots, roots, &c., which sources of supply have hitherto been allowed to go to waste in abandoned pine lands. The new industry, as yet, is only in the experimental stage, but it is being watched with interest by naval store dealers, who hope that an article produced in this way may be useful in the industrial arts, where cheaper grades are utilisable, and where it is not necessary to use the high standard qualities of spirits of turpentine which so far can only be obtained by distilling the pure gum of the pine tree.

XIII. C.—INDIA-RUBBER, Etc.

CRUDE GUTTA-PERCHA TRADE; CONTROL OF — BY THE CHINESE.

India-Rubber J., 1904, 28, 127—128.

In a pamphlet recently issued by the Philippine Department of the Interior, P. L. Sherman states that the entire crude gutta-percha trade is practically controlled by the Chinese in Singapore, the secrets of boiling, working over, mixing, adulterating, and colouring being closely guarded. Philippine gutta-percha is collected by natives, who receive from the middleman about 10 Mexican dols. per picul of 162*½* lb. The middleman carries the material to the coast and sells it to the Chinese exporter at the rate of 40—80 dols. per picul of 137*½* lb. The forestry dues (5—7 Mexican dols.) are paid by the exporter, who sends the gutta-percha to Sandakan (North Borneo) or Singapore, where it is sold for 100—150 Mexican dols. per picul of 133*½* lb., as North Borneo gutta-percha. It is stated that the Chinese in preparing the crude material for the European market are guided by smell, colour, toughness, and the softening and hardening test in hot and then cold water. So long as the collecting of the gutta-percha is in the hands of wild natives, and the manipulating and sale are controlled by the Chinese, there is no hope of the gutta-percha trade being placed on a fair basis.—A. S.

RUBBER PRODUCTION OF THE CONGO FREE STATE.

Bd. of Trade J., Aug. 4, 1904.

The total value of the rubber exported from Congo during 1903 is estimated at 1,828,754*l.*

* Hectare = 2.47 acres. Quintal = 220*½* lb.

XIV.—TANNING, LEATHER, GLUE, Etc.**QUEBRACHO IN PARAGUAY.***Foreign Office Annual Series, No. 3241.*

The quebracho extract business of Paraguay has greatly increased of late years, the value of the export having risen from 5,056*l.* in 1900 to 18,779*l.* in 1901, 44,032*l.* in 1902, and 60,125*l.* in 1903.

CHESTNUT WOOD EXTRACT; EXPORTS OF — FROM BASTIA (FRANCE).*Foreign Office Annual Series, No. 3246.*

In 1902 the total export of extract of chestnut wood for tanning to the principal markets outside France were 6,000 tons, Hamburg taking more than half; but Liverpool was the largest buyer in 1903, when the shipments were:—

	Barrels.	Tons.
Liverpool.....	15,200	4,100
Hamburg.....	14,500	3,900
Antwerp.....	5,600	1,500
London.....	2,600	700
Total.....	37,900	10,200

XVI.—SUGAR, STARCH, Etc.**SIZING STARCH: U.S. CUSTOMS DECISION.**

July 28, 1904.

A mixture of tapioca and potato starches was decided to be dutiable at 1½ c. per lb. under paragraph 285 of the present tariff, notwithstanding that tapioca by itself is free of duty. The claim of the importer that it was dutiable at 30 per cent. *ad valorem* under section 6 as a "manufactured article unenumerated" was overruled.—R. W. M.

XVII.—BREWING, WINES, SPIRITS, Etc.**ALCOHOL; OCTROI TAX ON —. U.S. CUSTOMS DECISION.**

The Treasury Department has directed an appeal to the Circuit Court of Appeals from the decision of the United States Circuit Court on the above (see this J., 1904, 784). Until this question is finally settled by the Circuit Court of Appeals, the decision of the lower court will not be followed by the United States Customs.—R. W. M.

XX.—FINE CHEMICALS, Etc.**PETIT-GRAIN OIL; EXPORTS OF — FROM PARAGUAY.***Foreign Office Annual Series, No. 3241.*

The value of the export of oil of petit-grain from Paraguay during the last few years was as follows:—1898, 1,920*l.*; 1899, 2,442*l.*; 1900, 3,818*l.*; 1901, 5,350*l.*; 1902, 5,831*l.*; 1903, 7,183*l.*

GLYCERIN TANNATE: U.S. CUSTOMS DECISION.

July 22, 1904.

A compound of glycerin and tannin made by a patented process, was assessed for duty at 50 c. per lb. as "tannic acid" under paragraph 1 of the present tariff. The Board of General Appraisers overruled this action, and sustained the claim of the importer that it was dutiable at 25 per cent. *ad valorem* under paragraph 3 as a "chemical compound."—R. W. M.

COUMARIN: U.S. CUSTOMS DECISION.

July 18, 1904.

Synthetic coumarin, produced from coal tar, was decided to be dutiable at 20 per cent. *ad valorem*, under paragraph 15 of the present tariff as a "preparation of coal tar, not a

colour or dye, and not medicinal." The assessment of duty at 25 per cent. *ad valorem*, as a "chemical compound," under paragraph 3, was overruled.—R. W. M.

Patent List.

N.B.—In these lists, [A.] means "Application for Patent," and [C.S.] "Complete Specification Accepted."

Where a Complete Specification accompanies an Application, an asterisk is affixed. The dates given are (i) in the case of Applications for Patents, the dates of application, and (ii) in the case of Complete Specifications Accepted, those of the Official Journals in which acceptances of the Complete Specifications are advertised.

Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, AND MACHINERY.

[A.] 16,855. Heinrich, Dierks, and Möllmann. Centrifugal liquid separators. [German Appl., Jan. 30, 1904.]* Aug. 2.

" 17,097. Wills. Furnaces. Aug. 4.

" 17,098. Wills. Furnaces. Aug. 4.

" 17,199. Mertens. Uniform coating of cylinders with deposit forming liquids. Aug. 5.

" 17,301. Doulton and Hopkins. Furnaces. Aug. 8.

" 17,314. Howorth (Soc. Franç. de la Viscose). Cocks or taps for viscid liquids. Aug. 8.

" 17,857. Bell. Drying apparatus. Aug. 9.

" 17,435. Heymann and Hey. Apparatus for separating and condensing the vapours of volatile liquids. Aug. 10.

" 17,536. Steele. Furnaces. [U.S. Appl., Aug. 11, 1903.]* Aug. 11.

[C.S.] 16,724 (1903). Schnöckel. Process and apparatus for the cooling of liquids. Aug. 10.

" 16,725 (1903). Schnöckel. Jet condensers. Aug. 10.

" 20,777 (1903). McNeil and McNeil. Evaporating or concentrating apparatus. Aug. 17.

" 21,188 (1903). Simpkin. See under X.

" 21,471 (1903). Newton (Bayer and Co.). Steam meter. Aug. 10.

" 21,896 (1903). Thomas, Richardson, and Davis. Apparatus for roasting chemicals and the like. Aug. 17.

" 5094 (1904). Soc. Anon. l'Ind. Verrière et ses dérivés. Processes for heating carbonaceous material applicable for chemical and other similar processes. Aug. 17.

" 5485 (1904). Browne and Chandler. Condensing and cooling of gases, vapours, and liquids. Aug. 10.

" 8481 (1904). Sagasser. Apparatus for purifying liquids by centrifugal force. Aug. 10.

" 11,752 (1904). McKenna (Holst and Fleischer). See under XVII.

" 14,075 (1904). Gostling. Continuous vertical kiln. Aug. 10.

II.—FUEL, GAS, AND LIGHT.

[A.] 16,869. Affleck. Method of improving the yield of hydrocarbons from carbonaceous matter. Aug. 2.

" 16,895. Bloxam (Bradley). Gas producers. Aug. 2.

" 16,916. Mitchell and Marriott. Binding material for coal dust and the like. Aug. 2.

- [A.] 17,191. Imray (De Madaillan). Manufacture of filaments for electric glow lamps. Aug. 5.
- " 17,247. Kelly, Billington, and Weir. Fuel for gas, oil, and other fires, for lighting purposes, and for utilising the waste products of combustion. Aug. 8.
- " 17,497. Bessey. Manufacture of peat fuel. [German Appl., April 25, 1904.]* Aug. 11.
- " 17,570. Williams. Gas producers. Aug. 12.
- " 17,580. Patterson. Method of treating coal for coking purposes.* Aug. 12.
- " 17,661. Redfern (Poetter and Co.). Coking ovens. Aug. 13.
- [C.S.] 10,687 (1903). Grayson. Manufacture of artificial fuel. Aug. 17.
- " 17,074 (1903). Plate and Lieb. Process for producing pit-coal and coke briquets. Aug. 17.
- " 17,283 (1903). Koppers. Coke ovens. Aug. 17.
- " 17,471 (1903). Middleton. Agglomerant for use in the manufacture of compressed fuel and a process of preparing the same. Aug. 17.
- " 14,718 (1904). Carpenter. Apparatus for use in the gasification of coal or other materials in the production of illuminating and heating gas. Aug. 10.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM, AND MINERAL WAXES.

- [A.] 17,485. Heymann and Hey. *See under I.*

IV.—COLOURING MATTERS AND DYESTUFFS.

- [A.] 17,274. Shillito (Aniline Colour and Extract Works, formerly J. R. Geigy). Manufacture of red and bluish-red azo colouring matters. Aug. 8.
- " 17,318. Ransford (Cassella and Co.). Manufacture of sulphine colours. Aug. 8.
- " 17,589. Newton (Bayer and Co.). Manufacture of new anthraquinone derivatives. Aug. 12.
- " 17,590. Newton (Bayer and Co.). Manufacture of new dyestuffs of the anthracene series. Aug. 12.
- [C.S.] 22,966 (1903). Cosway and The United Alkali Co., Ltd. Manufacture of sulphur dyes and of an intermediate product of the said manufacture. Aug. 17.
- " 23,179 (1903). Johnson (Badische Anilin und Soda Fabrik). Production of colouring matters of the anthracene series and of intermediate products relating thereto. Aug. 17.
- " 23,188 (1903). Imray (Soc. Chem. Ind. in Basle). Manufacture of sulphurised dyestuffs. Aug. 17.
- " 9932 (1904). Oakes. Processes for extracting from vegetable matters, glucosides possessing colouring or tanning properties, and also the products resulting from such processes. Aug. 17.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

- [A.] 17,152. Howorth (Soc. Franç. de la Viscose). Devices for spinning and drawing artificial silk. Aug. 5.
- " 17,240. Destrée and Wiescher. The dyeing of hanks or yarns.* Aug. 6.
- " 17,242. Kraiss and The Bradford Dyers Assoc., Ltd. Finishing piece goods. Aug. 6.
- " 17,330. Mitchell. Process of removing grease from cotton waste. Aug. 9.

- [A.] 17,334. Parkinson. Method of producing piece-dyed striped cotton venetians, and like cloths. Aug. 9.
- " 17,368. Howorth (Soc. Franç. de la Viscose). Machines for spinning artificial silk. Aug. 9.
- " 17,437. Heymann and Hey. Method and plant for removing grease and other impurities from woollen and other materials. Aug. 10.
- " 17,447. Howorth (Soc. Franç. de la Viscose). Devices for spinning viscose. Aug. 10.
- [C.S.] 19,404 (1903). Müller. Felt, and felted and like fabrics. Aug. 10.
- " 7172 (1904). Wiley. Apparatus for waterproofing fabrics. Aug. 17.

VII.—ACIDS, ALKALIS, AND SALTS.

- [C.S.] 19,505 (1903). Hardingham (Soc. Minere e Fonderie d'Antimonio). Production of oxysulphide of antimony. Aug. 10.
- " 14,848 (1904). Artigue. Apparatus for the commercial manufacture of oxygen. Aug. 10.

VIII.—GLASS, POTTERY, AND ENAMELS.

- [A.] 17,280. Fleming. Manufacture of earthenware and the like. Aug. 6.
- " 17,285. Robin. Composition for the manufacture of ceramic products. [French Appl., Aug. 7, 1903.]* Aug. 6.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

- [A.] 16,867. Sellars. Manufacture of cement. Aug. 9.
- " 16,940. Müller and Jarck. Heat non-conducting material. Aug. 2.
- " 17,370. Rüssiger. Revolving cement burning furnaces. Aug. 9.
- [C.S.] 15,181 (1904). Steenbock. Manufacture of a material for the production of cement. Aug. 17.

X.—METALLURGY.

- [A.] 17,010. Wild. Method of extracting gold from ores, concentrates, tailings, and the like. Aug. 3.
- " 17,031. Jackman, Woodcock and Ledgard. Manufacture of solder for aluminium. Aug. 3.
- " 17,121. Cowper-Coles. *See under XI.*
- " 17,209. Hunt (Williamson). The cyanide process of extracting precious metals from ores containing them. Aug. 6.
- " 17,231. Davies and Clark. Method of uniting or coating iron or steel with other metals. Aug. 6.
- " 17,345. Evans. Treatment of zinc and other ores. Aug. 9.
- " 17,407. Wolf. Separation of metals from their ores. Aug. 10.
- " 17,430. Metals Corporation, Ltd., and Cowper-Coles. *See under XI.*
- " 17,481. Monroe. Gold milling. Aug. 11.
- " 17,521. Swinburne and Radorf. Treatment of poor ores. Aug. 11.
- " 17,624. Leisel and Küpper. Manufacture of soldering paste. Aug. 13.
- " 17,630. Lark. Metallic alloys. Aug. 13.

- [A.] 17,660. Davies and Clark. Method of uniting or coating iron and steel with other metals, and fluxes employed for that purpose. Aug. 18.
- " 17,670. Heyl-Dia. Condensing of metal vapours from blast and other furnaces and apparatus therefor. Aug. 18.
- [C.S.] 17,109 (1903). Sulman, Cattermole, and Kirkpatrick-Picard. Concentration of minerals from ores. Aug. 17.
- " 21,188 (1903). Simpkin. Furnace for baking briquettes made of ore, concentrate, or other material. Aug. 10.
- " 21,299 (1903). Garrard and Ferranti, Ltd. Removal of scale from iron and similar metals. Aug. 10.
- " 21,854 (1903). Chaudoir. Cadmium alloy. Aug. 17.
- " 24,148 (1903). Weiller and Weiller. Production of metals, alloys, metallic oxides, and high temperatures. Aug. 17.
- " 24,825 (1903). Imbert. Process for extracting from their sulphides, zinc and lead and all metals whose affinity for sulphur is inferior to that of copper. Aug. 17.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

- [A.] 17,011. Delafon. Voltaic cell or element. Aug. 3.
- " 17,121. Cowper-Coles. The electrolytic deposition of metals. Aug. 4.
- " 17,196. Schauli and Petrides. Manufacture of plates and electrodes for storage batteries. Aug. 5.
- " 17,430. The Metals Corporation, Ltd., and Cowper-Coles. The electrolytic refining of copper. Aug. 10.
- " 17,639. Thomson. Electrolytic cells. Aug. 18.
- " 17,672. Dymond (Watson and Wheeler). Batteries.* Aug. 13.
- [C.S.] 21,609 (1903). Creswick and Shaw. Electro-deposition of metals upon aluminium. Aug. 17.
- " 9468 (1904). Neuburger and Minet. Method and apparatus for heating the charge of electric furnaces. Aug. 10.

XII.—FATTY OILS, FATS, WAXES, AND SOAP.

- [A.] 17,218. Armstrong and Armstrong. Manufacture of soap and detergent compounds. Aug. 6.
- [C.S.] 14,216 (1904). Brown (Warden). Apparatus for filtering and washing oils. Aug. 17.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, ETC.

(A.)—PIGMENTS, PAINTS.

- [C.S.] 22,806 (1903). Newton (Bayer and Co.). Manufacture of colour lakes. Aug. 17.

(B.)—RESINS, VARNISHES.

- [A.] 17,222. Walton. Manufacture of floorcloth, wall coverings, &c. Aug. 6.

(C.)—INDIA-RUBBER.

- [A.] 17,313. Price. Process for devulcanising and regenerating rubber waste. [U.S. Appl., May 26, 1904.]* Aug. 8.
- " 17,579. Tiehsen. Manufacture of a substitute for indiarubber.* Aug. 12.

- [C.S.] 17,156 (1903). Frankenburg, Ltd., Frankenburg and Betteridge. Rubber solutions or compounds. Aug. 17.

XIV.—TANNING, LEATHER, GLUE, SIZE, ETC.

- [A.] 16,888. Hannemann. Non-desiccating depilatories.* Aug. 2.
- [C.S.] 9932 (1904). Oakes. *See under IV.*

XVI.—SUGAR, STARCH, GUM, ETC.

- [C.S.] 16,750 (1903). Harrison (F. Hlavati and Co.). Manufacture of sugar. Aug. 10.
- " 23,703 (1903). Bate. Drying starch from rice or other amylaceous products. Aug. 17.

XVII.—BREWING, WINES, SPIRITS, ETC.

- [A.] 16,992. Baker and Ling. The sulphuring of hops, malts, and other materials, with special reference to the avoidance of contamination with arsenic, and apparatus therefor. Aug. 3.
- " 17,438. Hunt. Manufacture and maturing of spirit. Aug. 10.
- " 17,651. Linzel and Bischoff. Production from fermented fluid of a drink free from alcohol, by means of a vacuum. Aug. 18.
- [C.S.] 19,472 (1903). Henry. Apparatus for assisting the aerating of grain for malting, distilling, &c., during the steeping process. Aug. 10.
- " 11,752 (1904). McKenna (Holst and Fleischer). Malting and drying drums. Aug. 10.

XVIII.—FOODS; SANITATION, WATER PURIFICATION; & DISINFECTANTS.

(B.)—SANITATION; WATER PURIFICATION.

- [A.] 16,931. Dorling. The sterilisation of water.* Aug. 2.
- " 16,934. Lake (Jewell). The purification of water. Aug. 2.
- " 17,307. Walter. Water purifying apparatus. [Ger. Appl., Sept. 21, 1903.]* Aug. 8.
- [C.S.] 17,661 (1903). Boulton (Vasseur). Treatment of wash and other waste waters or residues. Aug. 17.
- " 20,021 (1903). Turner. Treatment of trade effluents. Aug. 17.
- " 14,709 (1904). Wheelwright and Fiske. Apparatus for removing oil and grease from garbage or offal. Aug. 10.
- " 15,235 (1904). Wheelwright and Fiske. Process of cooking garbage or offal and removing the oil or melted grease therefrom. Aug. 17.

(C.)—DISINFECTANTS.

- [A.] 17,320. Stephan. Disinfectant. Aug. 8.
- " 17,607. Endemann. Antiseptic compositions and process of producing the same.* Aug. 12.

XIX.—PAPER, PASTEBOARD, ETC.

- [A.] 17,232. Homberger. Method of imparting lustre to objects made of celluloid and the like. Aug. 6.
- [C.S.] 19,541 (1903). Harrison (Vellumoid Paper Co.). Manufacture of waterproof paper and the like. Aug. 10.

[C.S.] 14,447 (1904). Heennessen and Spix. Process of manufacturing figured glazed paper. Aug. 17.

**XX.—FINE CHEMICALS, ALKALOIDS,
ESSENCES, AND EXTRACTS.**

[A.] 16,996. Merck. Manufacture of new cyan derivatives of pyrimidine. [Ger. Appl., Sept. 15, 1903.]* Aug. 3.

„ 17,008. Newton (Bayer and Co.). Manufacture of pyrimidine derivatives. Aug. 3.

[C.S.] 24,723 (1903). Imray (Meister, Lucius und Brünig). Manufacture of compounds of the active substance of suprarenal glands. Aug. 17.

„ 25,546 (1903). Verley. Manufacture of proto-catechuic aldehyde and its derivatives. Aug. 17.

**XXI.—PHOTOGRAPHIC MATERIALS AND
PROCESSES.**

[A.] 17,009. Lake (Jacobson). Photographic reproductions.* Aug. 3.

„ 17,036. Lake (Jacobson). Photographic reproductions.* Aug. 3.

„ 17,192. Strasser. Photographic process. Aug. 5.

„ 17,610. Schmidt. Pigment photographic processes.* Aug. 12.

XXII.—EXPLOSIVES, MATCHES, ETC.

[C.S.] 17,414 (1903). Bell. Pressing of gun-cotton blocks, and apparatus therefor. Aug. 10.

„ 14,625 (1904). Hill. Matches. Aug. 10.



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Annual General Meeting.

COLUMBIA UNIVERSITY, NEW YORK.

SEPTEMBER 8, 1904.

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REPORT OF COUNCIL.

The number of members on the register on July 31, 1904, was 4,134, as compared with 3,950 at the last annual meeting. During the year 400 new members have been elected, as compared with 380 last year; and the losses have been 216, as against 224.

There have been 29 deaths, as compared with 44 last year, viz., Dr. A. P. Aitken, Mr. Alfred H. Allen, Capt. H. C. Aspinwall, Sir Frederick Bramwell, Baron W. de Bush, Messrs. Alexander Dick, E. E. Ewell, Harry Grimshaw, Jas. Hands, Dr. E. Hantke, Messrs. Jas. Heriot, Edwin Hunt, G. B. Jackson, H. C. Kohl, R. W. McKinlay, W. G. Macmillan, R. Preston, Geo. Rae, Julius Schad, C. Simeons, H. E. Slade, Major W. Staempfli, Jno. Stanning, W. Van Slooten, E. Robinson Walker, A. W. Walls, A. Weightman, Thos. Whiffen, and W. H. White.

The Journal for 1903 numbered 1,378 pages, equal to 57·5 pages per issue, as against 65·5 in 1902. During the past session 90 original papers, with discussions, have appeared in the Journal, as compared with 81 in the previous session. Of 30 papers returned to authors by the Publication Committee for amendment or condensation, 17 have been published after being recast, rewritten, or condensed, and three have been withdrawn.

The exchange list has been revised; journals which have ceased to be of value to the Society have been discontinued, and others, more useful, substituted. The decennial index for the years 1896—1905 is in a satisfactory state of advance, and it is hoped that it will be issued as contemplated in 1906. Pains have been taken to improve the illustrations in the Journal.

The Hon. Treasurer's financial statement, which was issued in the Journal for June 30th last, will be laid before the meeting.

Since the last annual meeting, the Sydney Section has been duly constituted, its by-laws approved, and papers from the Section published in the Journal.

From the Board of Trade the Council continues to receive for consideration important papers relating to the tariffs and trade regulations of other countries.

Allusion was made last year to the appointment of a committee to collect information from members as to the incidence of railway freights upon the chemical and allied industries. The replies received enabled that committee to report that the burden of freight was highest on the cheaper articles, and ranged from 15—30 per cent. of the value. Whether railways can carry at appreciably cheaper rates is regarded as doubtful; but, as proved by the experience of America, Belgium, France, and Germany, heavy freight can be carried much more cheaply by canals, if they be brought up to date and placed under independent management.

It has long been urged that Government, through a department, should be in closer touch with commerce and industries. In Germany the functions of the Minister of Commerce comprise the control of "all matters affecting handicrafts," and to it, as a consultative body, is attached the Technical Committee for Industry, which studies the scientific progress of industries, and keeps the minister in touch with them. America has recently established a Department of Commerce and Labour, and France has had a Minister of Commerce for some years. The Council two years ago appointed a committee to co-operate with Members of Parliament and others who were in favour of this reform.

The Society of Chemical Industry has during the past year been able to render effective assistance to the Royal Commission for the St. Louis Exhibition in respect of the British chemical exhibit. The chemical industries are represented at St. Louis by a collection which is described by the *Times* as "an excellent show on both the theoretical and practical sides," and it may fairly be said that the success which has attended the labours of the organising committee, all of whom are active members of the Society, would have been more difficult of achievement in the absence of the facilities which the Society was able to afford for making known the merits of the project. It is gratifying to record that the thanks of the Royal Commission have been conveyed to the Society for the services

thus rendered. The important section of the Society represented by the American membership cannot fail to share the satisfaction which the Council feels in having contributed in this manner to the carrying out of the wishes expressed by the President of the United States.

The concessions made by the British Government in respect of the use of untaxed denatured alcohol for manufacturing purposes have not yet proved of general value in chemical manufactures. There have been some variations in the denaturants used in some instances, notably in the manufacture of fulminates and celluloid, both of which manufactures are under continuous supervision by revenue officials. The Council is of opinion that the range of denaturants should be greatly extended, and that no increase of drinking or "illicit distillation" is probable as a consequence of granting concessions to British manufacturers under guarantee. The Council regards with satisfaction the indications that the subject of reductions in the differential duty on British-made alcohol, and an alteration in the regulations for the sale of suitably denatured spirit, are receiving the sympathetic consideration of the authorities. The extension of the use of internal combustion engines, and the consequent increase in the demand for volatile fuel, have also directed attention to alcohol as a source of power; and the employment of methylated spirit for domestic use and lighting and heating purposes has been found economical and practicable. The Council has long co-operated with the Chemical Trade Sections of the London and Manchester Chambers of Commerce, and the Joint Committee of this Society and these Chambers has been further strengthened by the addition of representatives of the motor, lighting, distilling, agricultural, and engineering industries. At the instance of this Committee, supported by many Members of Parliament, the Chancellor of the Exchequer has consented to appoint a departmental committee, including recognised commercial and scientific representatives, to examine into and report upon the best method of providing untaxed alcohol, denatured or otherwise, for industrial purposes. The Council desires to express its appreciation of the persistent efforts of Mr. Thomas Tyrer in connection with this industrial need.

The Executive Committee of the National Physical Laboratory at Bushy Park, on the governing body of which the Society is represented, and to which the Council has made grants from time to time, has petitioned the Treasury for a larger annual grant and an increased equipment to fit it for its scientific work. At the same time a series of constructive proposals for the future working of the Institution have been presented. The Council has given its support to a petition asking the Treasury that the Laboratory may be placed in a position to do its important international work by means of a grant for capital expenditure and an increased annual subvention. Among the more important researches carried out by the Laboratory during the past year may be mentioned those on pure iron-carbon alloys, certain nickel-steel alloys, mercury standards of resistance, a comparison of thermometers up to 1,100° C., and measurements of the specific heat of superheated steam up to a pressure of 200 lb. to the square inch.

In response to a request from the Director of the Department of Commerce and Labour at Washington, the Council has granted a free copy of the Journal for the use of the new Bureau of Standards. The Director of the Department states that the purposes of this Bureau are similar to those of the *Physikalisch-Technische Reichsanstalt* at Charlottenburg, and that in the future it will issue bulletins containing much valuable matter on the scientific work of the Bureau.

The Association of Chambers of Commerce, at a recent meeting in London, passed a resolution welcoming the instalment of reform secured by the Patent Law Amendment Act of 1902, to which allusion was made last year. It also expressed the opinion that all foreign-owned patents for inventions and designs workable in the country, which were not so worked within a reasonable limit of time, should be forfeited. The Council has since been invited to appoint delegates to a deputation to bring this subject before the President of the Board of Trade, and has consented, subject to a reservation in regard to the words "foreign-owned,"

In the opinion of the Council, if patents granted in Great Britain are worked elsewhere, they should also be worked here or lapse, whether they are "foreign-owned" or not.

The Society's medal, founded in 1896, and awarded by the Council once in every two years for conspicuous service rendered to Applied Chemistry by research, discovery, invention, or improvements in processes, has this year been awarded to Ira Remsen, President of the Johns Hopkins University of Baltimore. In 1896 the medal was awarded to John Glover, in 1898 to W. H. Perkin, in 1900 to Edward Schunck, in 1902 to Jos. Wilson Swan.

An invitation will be laid before this meeting from the Local Section of the Society to meet in London in 1905. It is hoped that this invitation will receive favourable consideration. American, Canadian, and Australian members will receive that cordial welcome which the Society has always experienced on these occasions. The Council trusts that American members will be present in force to support the President, who, as in 1900, will be a member of the New York Section of the Society.

The expenses of the Journal are necessarily heavy, and the Council trusts that members will make known to others the aims of the Society and the character of its Journal, so as to secure a constant addition to the membership, and thus permit of an equally constant extension of the Society's sphere of usefulness.

HONORARY TREASURER'S REPORT.

In the first place allow me, through Mr. Tyrer, who has kindly consented, with the Council's permission, to occupy my position as your honorary treasurer during this meeting, to express the very great disappointment which I feel in being unable personally to make the acquaintance of so many good and hospitable friends and brother industrialists.

Last autumn I fully hoped and intended to be with you to-day, but have been forbidden; and after three-quarters of a century of life one is bound to attend to what one's doctor says.

To me it would have been an immense pleasure to have met again those of you whom I have the good fortune to know, to have enjoyed the magnificent programme you have set before us, and to have seen something of your vast country and works; but this is denied me, and I can only trust to your kind forbearance for any apparent dereliction of duty towards you.

Turning from myself to my duty as treasurer, it is with pleasure that I am able to place before you the accounts for last year, 1903; these have been published in the 30th June number of the Journal, and you will, I think, find them clear and explicit.

The first account, that on page 642, shows the Revenue and Expenditure for 1903. There was a net balance to the good of 840*l.*, and this, with the entrance fees (which are not reckoned as revenue, but are always invested), has been funded in good securities during this year.

It may be well to explain that this account is dated as made up to the 20th May 1904, and it will be seen that it includes all subscriptions for 1903, whether paid in former years or during 1904. On the other side of the account all liabilities for 1903 have been paid and are included, so that the statement shows accurately the year's working.

In connection with this, I should mention the rule, of which probably some of you are not aware, that the Journal is not forwarded after February in any year to those members whose subscriptions have not been received in London by that time, but on their subsequent receipt the back numbers are sent.

As treasurer it is right that I should explain to you that after this year it is probable that there may not be such a balance on the year's working. Publishing twice a month, and giving abstracts of American and French patents, has very materially increased the cost of editorial work, printing, and posting. Our present contract expires at the end of this year, and a considerable increase appears probable. The decennial index, combining the 10 years 1896 to 1905 inclusive, will be costly, both for editing and printing, although considerable sums have already been paid in preparing it to date, and debited to expenditure in each

year. When finished it will be a complete index to all the available information to the end of 1905 in the 24 sections into which the chemical industries are divided in our Journal.

I am only expressing the unanimous feeling of your Council in saying that they desire to keep the Journal up to the highest standard for information and promptness of publication, and to publish, subject to the rules of the Society, papers which have been read before the Sections, containing new and useful matter; but it must be borne in mind that every page has to be paid for, that lengthy papers are apt to be merely glanced at, and not read, so that it is very desirable to condense as far as possible, to avoid redundancy of expression, and to make judicious use of references.

Like other journals, advertisements form an important item, though they do not appear in the present balance sheet, being included in the contract. Those who can advertise will be assisting the Society by so doing, and also by obtaining the addition of new members.

Referring again to the accounts, the second statement, on page 643, shows the actual position of cash and securities in your honorary treasurer's hands on the 31st Dec. 1903. The securities are in the names of three trustees, and are all first-class. You will see by the chartered accountants' certificate that they have all been verified by them, as have also all receipts and payments during the year. The interest on the funded property amounts to over 400*l.* a year.

Allow me to detain you for a few minutes longer with that side of our Society which not only benefits ourselves individually, but the world generally. I mean its cosmopolitan or international character. One can see its far-reaching usefulness from the fact that, whilst reckoning the British Isles, the United States, Australia, Canada, Germany, India, as only one country each, your fellow members live in 62 different countries; your New York Section, with its vast area, has just over one-quarter of the whole. Germany has over 50 members, "Far Cathay" 2, and Japan 30, whilst such places as Siam, Korea, Turkey, Syria, Borneo, and 50 others are represented.

Can anything more be wanted to show the value of the Society and the Journal? Is it too much to say that it is the best journal of the kind published? Judging by the care your Publication Committee give to the work, to which I can personally testify, and from the reports one hears from outside, it seems to me by no means too big a claim.

Believing as I do that the intercommunication of knowledge useful to all is for the general welfare of the world and the gradual reduction of jealousies, it has been much pleasure to me to serve the Society in the office in which it has done me the honour to place me. My only regret is not being with you to-day.

PRESIDENT'S ADDRESS.

On this occasion of the first visit of our Society to America, let me thank you for the hospitable reception which you have given us. We are proud of our New York Section; we are glad to be associated with your great nation; and, although separated by an ocean, though we differ as regards methods of government, and as regards some of the items of policy which the Governments of both nations pursue, we admire your energy, your progress, and the inventive ability of your people.

Gratitude has been defined as a sense of favours to come, and we know that we have reason to be grateful, for you are about to give us, your guests, a token of your regard; you are going to show us your magnificent country, and to demonstrate to us the enormous developments in chemical industry which you have made. We look forward with pleasurable expectancy to the treat which you have in store for us; and we ask you to accept our heartfelt thanks.

It is customary in our Society for the President to give his address when he is on the eve of retiring, and I have looked for hints in those of my predecessors. I had thought that perhaps some suggestions dealing with the training of technical chemists—a subject of which I have now had over 30 years' experience—might have been

favourably received, and I find that this has been a favourite subject with the Presidents of our Society, and that it has been discussed at length by Mr. Beilby in an address delivered in 1899 to the London Section. The history of our industries in London has been described by Sir Frederick Abel in 1882; Sir Frederick also discussed the early history of explosives in 1883; in 1884 Mr. Weldon gave an account of the development of the alkali and chlorine industry; he was followed in 1885 by Dr. Perkin, who, in a charming sketch, told the history of the foundation of the manufacture of colouring matters; Mr. Muspratt, in 1886, gave some interesting information regarding the early manufacture of alkali in Liverpool; in 1889 Dr. Mond described attempts which have been made to produce compounds of nitrogen from free nitrogen; in 1890 Sir Lowthian Bell discoursed on blast-furnaces; in the following year Mr. Rider Cook gave an account of the processes in use at that date for the disposal of sewage.

We find Prof. Emerson Reynolds lecturing on coal, peat, and oil as fuels; Sir John Evans, on the paper industry; Mr. Stanford, on the kelp industry; Dr. Thorpe, on the carburation of gas; Dr. Schunck, on his remarkable researches on the colouring matters of plants; Mr. Beilby, on smoke consumption; Dr. Swan, on electro-chemistry; while Prof. Chandler gave a sketch of the development of chemical industry on this side of the Atlantic.

In short, we have had specialists each discoursing on his own subject in a masterly way. The memory of many of these eminent men is all that remains to us; but we are glad to realise that many still remain among us, working enthusiastically for the progress of the science which they love so well.

For it is impossible to sever science from industry. Many of the addresses emphasise this point. Sir Henry Roscoe, in 1882, said: "My object has been to show that in certain branches of chemical industry, at least, it is only the highest and most complete scientific training that can command commercial success." Dr. Perkin, in 1885, in discussing technical education, emphasised the fact that "what is wanted is a thorough knowledge of chemical science, and knowledge how to use it by conducting research" "The linking together of industrial and theoretical chemistry has undoubtedly been the cause of its wonderful development." Mr. Stanford, in the year of the foundation of the New York Section, said: I think it could be easily proved that nothing ultimately pays better than original research." And in defining research he wittily divided the human race into two classes: "those who go ahead and do something, and those who sit still and inquire why it wasn't done the other way."

Much has been said about the right course of training for a technical chemist, and the example of our Continental friends has been freely cited. No doubt we have much to learn from them; yet there are some first principles which lie at the root of the whole matter, and which I will venture to lay before you, in the hope that they will commend themselves by being self-evident.

I am aware that all of them have often been laid down before; "there is nothing new under the sun," so far as first principles are concerned, at least. Yet that is no reason why they should not be stated again, for perchance constant attrition may soften the stony hearts of those whose decision is important in such matters.

The education of a chemist (and the word "chemist," of course, includes the qualification "technical chemist") must be conceived in the sense that it consists in an effort to produce an attitude of mind, rather than to instil definite knowledge. Of course the latter must not be neglected; the definite knowledge may be likened to the bricks which the architect has at his disposal in erecting a beautiful building; he knows their shapes, their capacity for resisting stresses, and, in short, what can be done with them. But the conception of the design is the result of many attempts to create; just as the poet has to utilise words, or the architect bricks, so the chemist has to know the materials with which he is dealing. The training of a brick-layer, however, will never make a man an architect; nor will the dry research of a grammarian train a poet. In short, it is the inventive faculty which must be cultivated.

Here I am met by the criticism—"The inventive faculty must exist; it cannot be implanted." "Poeta nascitur, non fit." I deny it. There are some persons whose dislike for the investigation of Nature is ingrained. I remember at Bristol advising a lad to abandon the study of chemistry for that of literature on learning his disgust for the former and partiality for the latter. He became the editor of a newspaper. But such persons are few. It is unlikely that they will ever begin the study of natural science, unless impelled by too expectant parents; as soon as the horse begins to trot, "they do not remain." My contention is that most of the lads who enter a chemical laboratory are able to receive some inspiration, or to have a latent inspiration developed, which will fit them to become inventive chemists.

Now how can this be brought about? The answer is perfectly simple: by offering them examples. Every teacher in the laboratory, from senior professor to junior assistant, must be engaged in research, and, most important of all, they must not be reticent, but willing to converse freely on their problems. It is that which creates a "chemical atmosphere." The objection may be raised that junior students are not ripe enough to make any use of such examples. True; and for that reason it is well for the juniors to spend the first year attending lectures and practical classes in rooms for the purpose, and not to let beginners enter the general laboratory. Moreover, they should be spending the major part of their time in attending courses on physics and mathematics, and in the drawing-office. But during the second year the initiation should begin. Even during the first year the seniors will talk occasionally about what occurs in the main laboratories; the publication of some discovery is sure to be discussed in the junior laboratory, just as the servants' hall discusses the doings of the drawing-room; and the criticism is sure to be somewhat keen, even though—perhaps the more so because it is—founded on insufficient information.

There are some simple ways of furthering this spirit of research. First, as regards the students. I regard it as a mistake to provide special laboratories for different classes of students. If students of organic chemistry are walled off from those who are working at analysis, then neither set knows what the other is doing. The best instruction that a student can get, he acquires in having to explain his operations to his neighbours. Now it is customary for the study of organic chemistry to follow on that of inorganic; the organic student is usually the senior; and it keeps up his knowledge of inorganic chemistry if he has frequently to place it at the disposal of his neighbours who are making routine analyses. They, on the other hand, cannot help seeing the very different processes employed by the organic man; and they insensibly learn a number of tips and dodges which prove of service to themselves at a later stage.

There is a further advantage. The junior, to whom everything is at first strange, meets at once with ancient mariners who have sailed seas unknown to him, and who are proud to be able to display a little erudition; to do so does not imply love of ostentation, or spiritual pride; it is simply human nature. A little care makes it possible to assort one's students, so that a shy boy is placed next a kindly senior, and a cocky youngster who thinks that he knows everything is placed next a man who will stand no nonsense, and whose chaff and banter soon dispel the inflated ideas of his own powers which the youngster has brought from his science school. Indeed, the lesson learnt is, that the chief question is not—"What does he know?" but "What has he done?"

Of course, for complicated researches, where much elaborate apparatus is erected, special rooms are necessary. But I have noticed frequently that the inhabitants of these rooms hold informal receptions, and have pleasure in exhibiting the result of their skill in manipulation and in glass-blowing.

In some laboratories a tame glass-blower is kept on the premises. There cannot be a greater mistake. If the members of the teaching staff are glass-blowers, "es geht von sich," as the Germans say. The whole laboratory becomes proficient. Each imitates the other. No doubt advice is

often given which refers to the folly of paying sums for apparatus which it is possible to construct with little trouble, after knowing how; and the money is better spent. And glass-blowing is an all-important adjunct to research. I cannot imagine how anyone can stand the annoyance of having to wait for hours, possibly for days, for the repair of a piece of apparatus, which would probably take fewer minutes if the owner was able to manipulate a blow-pipe. Nearly the same may be said of the mechanic's place in the laboratory. Here, however, the work is slower, and in many cases the mechanic's services may be required; but for small repairs, such as soldering, repairing, contriving stirring apparatus, electrical apparatus, &c., much may be done by the student himself without any direct teaching. I confess, however, that a mechanic is necessary, if only to see that the tools are kept in order.

After the preliminary year I do not think it advisable for the student at once to commence research. There are the usual subjects of complex qualitative and simple quantitative analysis to be mastered, separations, gas analysis, and the preparation of typical organic and inorganic compounds, besides physico-chemical operations, such as vapour densities, determinations of molecular weights, conductivities, and electrical separations. But the time spent on these may easily be too much extended. A fairly good student should have done enough, in a year and a half or two years, to place him in such a position that, if necessary, he can help himself when he is face to face with an analysis which he has not made before. By mixing research students in the same laboratory with others at all stages of advance, the man who is working at analysis insensibly gets to regard his operations as partaking of the nature of a problem, and pursues his work with the greater interest. Moreover, it is not difficult to intensify this view of the question by contriving variations on ordinary routine; the determination of calcium and magnesium in a shell; the estimation of phosphoric acid in a bone; the Dumas method for nitrogen applied to a dried mouse; the analysis of the gases of respiration of a fly kept in air confined in a tube over mercury, and so on. When an analysis is regarded as a problem, it gains greatly in interest. And it can always be checked by a duplicate, and if necessary a triplicate. It often happens, moreover, that the research-work of a senior student is greatly helped by analytical work which can be safely entrusted to a junior. In this way double interest is gained—in the problem set, and in the research which the solving of the problem furthers.

Above all, not too much teaching. The essence of scientific progress is the well-worn method of trial and failure. It is simply horrible to think of the travesty of teaching in vogue in some of our colleges, where everything is provided, and where the students add one solution to another by word of command, and record their results in special notebooks constructed for the purpose. What do they learn? To obey? That should have been taught in the nursery. Manipulation? Manipulation consists in constructing what is required, not in using what is given. I had rather see a youth commit the *Aeneid* to heart than carry out such time-wasting, soul-destroying routine operations. The first may result in a stronger memory; the second is fatal to all originality.

It may be said that by thus leaving the students very much to themselves, much time is lost. Yes; possibly at first. But the ultimate rate of progress is very much more rapid. Unless the pupil learns to be of use to himself, he cannot possibly be of any use to others. And the training consists in finding out how to do it; not in doing it; that is easy, if one knows how.

Let me consider the matter next from the point of view of the junior staff—the assistants, or whatever they may be called, "*Privat-docenten*," lecturers, instructors. It must never be forgotten that these young men have their way to make in the world; that it is unjust to treat them as teaching-machines; and that the only opportunity given them to make their mark is to afford them all possible encouragement to further the aims of their science, for in doing so they will further their own aims. They must become known; and without publication of their work they will remain unknown; and without reasonable

leisure for research they will be unable to publish. Hence the duties of the members of the staff of a laboratory should be so arranged that at least half their time is available for research. Again, I am a firm believer in encouraging joint work done by assistants and students; the student gains much, and the assistant gains an assistant. Moreover, he learns the chief duty of a professor—the need of retaining in his mind problems for solution, and the art of getting the most out of his students in encouraging them to think for themselves. It is, indeed, an apprenticeship, where the young teacher learns his trade. He must have tools to work with; these tools are the students who act as his assistants. I regard it as essential, therefore, that the laboratory should have such a number of assistants that each one has half his time at his own disposal.

But, it may be urged, the number of assistants must necessarily be much greater than the possible vacancies in chairs, and it must therefore follow that many men will grow old in subordinate posts, and grow sick with hope deferred. Here the manufacturers should step in. A man who has had such an experience as I have sketched is invaluable, if he is not too old, as a works chemist. It is true that he may have had no special experience; but that matters little; in six months he will have grasped the principles of the manufacture, and if he is a man with the experience I have tried to sketch, he will be able to get the most out of men—perhaps the most valuable quality which a works manager can possess—and he will have a great deal of experience, experience perhaps not of a kind to be immediately useful in the particular work in which he is employed, but possibly of great value if the processes used in the work are to be altered. It must be remembered that the assistant must have proved his capacity for research and his ability to deal with other men before he is appointed; and he must have justified his choice. Here I may justify my own opinion by citing the practice of many German manufacturers; it is the rule, not the exception, to induce the assistants from university laboratories to enter their works.

I come next to a question which I have some delicacy in alluding to—the pay of an assistant. While it should be sufficient to enable him to live an unmarried life with comfort, it should not be sufficient to induce him to spend his life in a subordinate university post. He should have reason to wish to better his condition. It is impossible to lay down a hard and fast rule in such matters; but the point should be borne in mind.

If the assistants are to be given leisure for research, the number must be considerable; in fact, a double staff, in a sense, must be employed. This raises the question, How many students should be in the charge of each assistant? The question does not admit of a definite answer; yet an approximate one may be given. It necessarily depends on the class of work which the students are doing. If each assistant is told off to superintend the work of two or perhaps three students who are pursuing investigations—the junior assistants will necessarily have fewer, the seniors perhaps as many or more—each of these men may take much attention on some one day, and need not be looked at for perhaps a week or more, except in a general way. In that case perhaps ten or twelve systematic students might be allotted to each assistant; but it necessarily depends greatly on the nature of the work, and of the assistant himself. My experience is that assistants are disposed to be almost too conscientious, and to devote not only an unnecessary but almost an injudicious amount of attention to each student. I am not sure that the students look at it quite in the same light; it is so much easier to be taught than to learn. Very few of us care to think if we can possibly avoid it; I confess that I have frequently spent far more time in looking over papers in order to find a calculation which I had previously made than would have sufficed to make the calculation anew.

We come next to the senior teachers, or professors. The first point I would urge is that, while it is possible to lecture to as many students as the largest lecture-room will hold, it is not possible to supervise the practical work of more than, say, forty or fifty students. The professor should always know what every man is doing. It is not necessary that those who are engaged in routine-work should be

visited every day; they are under the care of assistants; but it is necessary that the professor should be able to gauge the capacity of each of his laboratory students; for only thus can be tell whether they are profiting by their studies. The reason why the old laboratories of Liebig, of Wöhler, and of Bunsen are regarded with such loving memory by those who were the students of these great men is that the total number of students was small; they formed a family party, where the individual character of each was known, and where the father lived among his children, and was able to distribute correction, reproof, and instruction in righteasness. Hence the necessity for limiting numbers. Now, if there are forty students, and the professor spends ten minutes each day with each—no great allowance of time—simple calculation shows that more than six hours are gone. I think that two hours is ample for the professor to spend daily in teaching laboratory students. Of course at some critical moment he must spend a much longer time with one; it may be several hours; but that should absolve him from attendance on that individual for the best part of a week. It is better to mix example with precept, and unless a large part of every day is given to research, the professor loses the attitude of mind which it is his duty to cultivate in his students. It does not do to let a day pass without making some effort to continue research; the habit is only too easily lost; it is like all arts; the successful pianist or violinist spends many hours each day at his instrument, and if the acrobat were to take a month's holiday, he would require to begin to learn his trade again. Moreover, it is only by continually keeping his hand in, and his mind turned on his own research, that the professor can conceive new problems, some of which are simple enough to form the best introduction to research to be carried out by his students.

Again, in a large laboratory, the time occupied in the details of organising is so great as to make a heavy call on the energies of the professor, who is necessarily the director. There are parents to be seen; notebooks to be read; correspondence with old students in search of employment; apparatus to be ordered; servants to be directed; in short, the whole management of a business in addition to the work of teaching and research. The cares of management grow very rapidly with the increase in size of the laboratory, and many of the duties cannot be delegated. Moreover, there are the calls of public duty which often press very heavily on the successful scientific man. Add to these the share which it is always necessary to take in attending university councils, and it is manifest that the administrative duties should be simplified as much as possible.

If the reputation of the professor is such that students crowd to his laboratory, my counsel is, do not build larger laboratories, but appoint a new professor, with a separate chair, and a new laboratory; but do not make your man of talent a mere administrator.

This leads me to touch again on the technical side of my subject; I must refer to the question of remuneration. If the best men are to be attracted towards any career, an inducement must be offered, of such a nature that a young man, deciding on his future prospects, may be influenced to choose it. It is not necessary that all the members of the profession should be highly remunerated; but it is necessary that some should. Although I am not here to defend the particular case which I am going to mention, I wish to refer to it as specially applicable: the Archbishop of Canterbury has an income of 15,000*l.* a year; many bishops receive an annual income of 5,000*l.*, and the result is that young men take orders who will ultimately have to be contented with very small emoluments. Now in the payment of university professors, it must be kept in mind that the men who fill the chairs are withdrawn from the practice of medicine, law, engineering, and other professions, including that of technical chemistry; and if they are to teach others, it is greatly to be desired that they themselves should be of the best of their kind. Hence there should be prizes for the best, comparable in amount with what a successful lawyer, doctor, or manufacturer would earn. If this is not done, then one of two things will result: either the standard of teachers, and consequently of teaching, will be lowered, to

the great disadvantage of the next generation of professional men; or the position of teacher may be accepted by enthusiasts, who could have made a much larger income had they entered professional or commercial life, and who will therefore be making a life-long sacrifice for their country. Probably both will happen; a few chairs will be filled by such enthusiasts, while the average professor will be much below par.

Of course other considerations must enter into the question of remuneration. The life is a regular and pleasant one; there are practically no risks; the standing is good; but I submit that, making due allowance for these, the prizes should exist. And they should reach the right men. How can this be achieved?

This brings me to consider the method of appointment to chairs, and that involves the government of the university. It is a large question; but as the reputation of a university is entirely dependent on the standing of its professors and teachers, it must be considered.

There are as a rule three methods of appointing to chairs: one is selection by a council or committee—by the governing body of the university; and this, in fact, amounts to selection by the principal or president, for as a rule the principal or academic head of the university is regarded by the council of outsiders as the best judge of scholastic matters. The second method is selection by a committee of specialists appointed by the university; if, for example, a physical chair is vacant, it is filled by a committee consisting of four or five eminent physicists, themselves not connected with the university in which the vacancy occurs. The third method, and it is the one which commends itself to me, is selection by a committee of the faculty in which the vacancy occurs, after a reasoned report in which the relative merits of all the possible candidates are discussed.

The reason for my preference is a very simple one: it is because selection by persons belonging to the same faculty of the university unites two qualifications in the persons of the electors—competent knowledge on the one hand, and self-interest on the other. Choosing, as an instance, a vacant chair of physics, the committee of selection would consist of any other professors of physics in the university, provided there were more than one; the professors of chemistry, biology, mathematics, botany—of all sciences to which physics is a fitting introduction. These men of science either know, or can make written inquiries about possible candidates. They discuss all the *pros* and *cons.* of each one; and they finally resolve to ascertain whether two or three persons would accept the vacant chair, if offered to them. They then make their recommendation either to the governing body of the university, or to some state official; and the question is asked and the post accepted.

Now it is the interest of every one of the members of the committee to secure the best man; and as it is to be presumed that they are themselves all engaged in investigation, they will select an occupant of the chair who has already made his mark, and shown that he can be relied on to continue to carry out investigations. His reputation will reinforce theirs; his tenure of the chair will add lustre to the university. Moreover, as all sciences touch, they will have a colleague from whom they can get advice; who will aid in the development of their own sciences.

It is true that the academic head of the university—the principal or president—may be influenced by like motives, and that any selection which he may make may be made on very similar lines, after a similar inquiry. But the filling of a chair is not a single-handed job; if it is single-handed, it is likely to become a job; either the principal is not able to get the required information, or his judgment is not so sure as that of those colleagues more intimately connected with the subject of the vacant chair. Selection by the principal *may* succeed; selection by colleagues of the same faculty practically always succeeds.

As for selection by a committee of outsiders, they have no feeling of responsibility. From personal experience, I know that their aim is satisfied when they have elected a man who will not disgrace their choice; they do not necessarily select the best man. I know, having had to act as

an elector by all three methods, that one is much more particular when one has to choose a fellow-teacher with whom one has to pass one's days. It is like choosing a wife. A lady chosen by the vote of the families may prove a success, and no doubt often does. If the wife were chosen in cool blood by the man who is to live with her, after careful inquiry into her antecedents, hereditary and otherwise, her temper, her suitability for the duties which a wife is supposed to perform, there would be fewer unsuccessful marriages. The analogy breaks down; for, unless it is a case of marrying a widow, previous experience should not be a possible consideration. But in selecting to a chair it must; and this leads me to ask, From what group of persons should a professor be chosen?

There are large universities, and there are small ones; and obviously the professors in the smaller institutions will be available for selection to the larger ones, with their greater field of usefulness and their higher emoluments. Should the professors in the smaller universities have justified their election, they will doubtless be the first to be considered in filling the more important chairs. And for the chairs in the smaller institutions, the assistants will be available. They will have published work of a nature to make their names known as promising investigators, and they will have commended themselves to their chiefs as capable men to whom the management of a department may well be entrusted.

The choice of the assistant from among the senior students may be left entirely to the professor with whom he has worked, and who is best able to judge of his powers. He will doubtless have filled the position of a student-demonstrator, in looking after junior classes; and his frequent appearances at the local scientific society will render it possible to estimate his ability as a lecturer.

And now let me discuss a question which has not given difficulty in America, I understand, but which has greatly retarded the advance of knowledge and research in England. I refer to examinations. It may well be introduced here, for it may be asked, Should only a graduate be recognised as worthy to occupy a junior teaching position? To this I would reply, Let the choice be free. I have often seen men whose circumstances, or whose character, or whose deliberate choice has led them to abstain from taking a degree, and who, nevertheless, are most successful investigators, well able to increase the knowledge of their subject, and who have proved most inspiring teachers; and, on the other hand, I have perhaps more frequently come in contact with graduates whose only claim to recognition was a parrot-like ability to repeat what had been told them, and a knack in gauging the idiosyncrasies of an examiner. The older I get, the less I believe in university degrees as a test of capacity. Perhaps the reason is the manner in which degrees are awarded in England; the degree follows on one, or at most two examinations, often by men who know the candidate only as a number, and whose idea of examination often is to set questions to trip the candidate, and not to draw out what he can do. Indeed, it raises the question which I have mentioned earlier in this address: the examination is so contrived as to elicit what a man knows, rather than what he can do.

Now here, again, there are certain obvious truths which have often been stated, but too often ignored. The student, working under the eye of the professor and of his assistants, undergoes a daily examination. He may not earn marks; but, none the less, he impresses his teachers with some conception of his character; and the impression is made rather by what he can do, than by what he knows. The qualities tested by such examinations as have been customary for the past forty years in England are the last which one would wish to have in a student of science—readiness of memory to the exclusion of deliberate judgment; the faculty of spreading knowledge thin, and making a veneer of scientific facts instead of the power to correlate them and increase their value; and the skill to gauge the capacity of and hoodwink the examiner, instead of the power to incite enthusiasm in others. They are ideal qualities for a successful barrister, because they pay in his profession; but their reward has been the bane of science. A sound judgment, though it may be a slow one;

persistence in struggling against obstacles; the knowledge where to get information when required, and to use it when found; and the inventive faculty—these are the qualities required, and they can be gauged only after long-continued observation. Moreover, the pernicious system of competitive scholarships and fellowships, instead of eleemosynary support given to the necessitous and deserving youth, has also contributed much to the debasement of the scientific spirit; for it has early implanted in the young mind the idea that to outrun his fellows, and to work solely for a money reward, are the ends to be aimed at, instead of the joy of the exercise of a divine gift, and the using that gift for the benefit of man. It is true that to earn money is a necessity; it is in no way a wrong aim; but it is not the chief aim; and money should be earned as a reward for useful labour, not for success in scholastic competitions. I am aware that these evils are much less noticeable in America than in England; and also, fortunately, public opinion is beginning to recognise, in England, that such inducements to work do not select the best men, so far as science is concerned. Under present circumstances, however, as scholarships exist, and must be awarded by examination, it requires considerable ingenuity to devise a method of examination which shall pick out men who will make a good use of them. I recently gave as a question for my own students, "Describe shortly the researches which have been going on in this laboratory during the past six months"; and I found the result very satisfactory. The question put a premium on the interest which a student should take in his friend's work, on the intelligence in following it, on his powers of description, and on his suggestiveness where invention had to stand for want of accurate knowledge. The after-effect of such a question, too, will be considerable. The students will endeavour in future to follow the researches of their neighbours with more understanding than they have done.

A question sometimes debated is whether the professor should lecture to junior or to senior students. Should he introduce the young student to the study of chemistry, or should he lecture to the most advanced students on recent developments of the subject? My reply would be, that students are much over-lectured. The object of lectures is more to open out a subject, and to direct a student what to read, than to give definite information. And for that reason I think the senior teacher is the best for junior students. Experience has generally taught the older man how to make his subject interesting to beginners; he has learned the art of repetition without showing that he repeats; he does not travel too fast on roads untravelled before by the young student; and he is more lenient to their often absurd efforts to form correct conceptions. On the other hand, the senior student is less exacting than the junior; to him the matter is more important than the manner of delivery; if the lectures prove useful to him he is ready to excuse any want of judgment on the part of the young teacher. For these reasons, therefore, I incline to think that the junior courses are better entrusted to the senior man, and the more advanced courses to the junior teachers. But we have found it advisable to ask individual advanced students to deliver short courses of lectures on special subjects of which they have made a study; no fee is charged for admission to these lectures; and they are much appreciated both by the deliverers of the lectures, as a field for practice, and by the students, as an easy way of becoming acquainted with special branches. We do not usually insist on the attendance on lectures beyond the third year; indeed, the formal lectures end in the second year. We find that more progress is made by the students through reading and conversation than in a more formal way. But here, again, the course followed must depend more on the individual cases than on any general rule; some learn more easily through the eye, others through the ear. On the whole it is better to appeal to both organs of sense, and utilise, as it were, a system of double entry.

It consequently appears to me futile to extend courses of lectures to more purely technical subjects. The ideal plan of education for technical chemists would be some system analogous to the apprenticeship of engineers, after they have been educated in the science; that is, after the correct habit of mind has been largely formed. But it is difficult

to see how this can be brought about. The obstacles in the way appear to me to be insurmountable. The chemical manufacturer is not willing to throw open his work to students, nor would he do so even if very considerable premiums were paid. Indeed, in England, it is not uncommon for the "chemist," so-called, to be refused admission to the works, and to be confined to the laboratory. In the larger German works, where many chemists are employed, it is possible for a young man to gain the requisite experience. I have been informed by the managing director of a chemical work in Germany where 70 chemists are employed, that nature has divided the young men into three large classes, the members of which are fairly easily distinguished, and do not greatly overlap. There is first the routine chemist; the young man who declines responsibility, but who is hardworking and trustworthy; he finds his place as an analyst, testing raw materials and analysing the products at various stages, including the finished products. Second, there is the young man to whom the management of some department may be entrusted; one with a firm will, plenty of energy, and the quality of governing men. And third, there is the research chemist, who delights in new problems, whether suggested by others or conceived by himself. All three classes are utilised; and after forming one of the analysts for some time, the young men naturally range themselves in one or other department, where their natural tendencies find scope. But even in Germany the number of works which employ 70 chemists is not great; and with a small number it is more difficult to effect the division of labour so satisfactorily.

I have wondered if it might not be possible to establish a training school for technical chemists somewhat on the following lines:—To start an association having for its object the encouragement of invention, each member of which would subscribe a certain sum for the erection of buildings and plant. There would need to be a number of isolated buildings, and a considerable collection of stock plant of a small scale—still, tanks, evaporating pans, filter-presses, vacuum-filters, centrifugal machines, crystallising vats, and so on. The work should be furnished with steam and electric current. Such a syndicate might let it be known that they were willing to make arrangements with inventors, or with syndicates which had secured the patents of an invention, or secured an option on such patents. The superintendent or professor should be provided with a staff of assistants, who would be each in charge of one building—that is, of one operation. Students would be admitted for an appropriate premium, as in engineering works. Supposing an idea to be brought to the notice of the directors, they would consult as to whether it should be accepted or not. If accepted, then the share of profits would be arranged with the patentee, should it prove successful. It would be committed to the charge of one of the staff, who would first work it out in the laboratory with the aid of a staff of students. If it then seemed feasible, it would be tried on a comparatively small scale, dealing with hundredweights, in one of the special buildings, those students who had investigated the process in the laboratory sharing in the larger-scale operations. The surmounting of difficulties in the transition, the perfecting of the process, the making working drawings of the requisite plant, would

afford the best of all training to students; and in case the process proved a commercial success, these students who had helped to elaborate the process would be naturally the first to obtain employment in works, should they be erected. At the same time, manufacturers would naturally be anxious to obtain the services of men trained in so good a school, so that many students would be drafted off to works. Indeed the scheme may be paralleled from the medical side; after receiving a medical education, for example, in preliminary scientific subjects, such as chemistry, physics, and biology, the medical student devotes himself to professional studies for three years. Then his technical education begins when he becomes house physician or house surgeon. After such experience, he is available for junior positions, for becoming "locum tenens," and so on.

The students in such an experimental works would, of course, have to do labourers' work; employees always respect a man who can "take his coat off." In this way he gets to know their difficulties, and to judge them fairly; to know what they can do, and what reasonably to expect.

I am by no means sanguine that such a scheme of technical education can be started. I acknowledge that it is an imperfect imitation of the magnificent schools of technical chemistry which form part of every large German chemical work. But such schools are unlikely to find a footing, so far as I can judge, in England. I cannot judge of America. Our system is, when trade is good, to let well alone; the manufacturer thinks, "I have done very well without a chemist so far; why have one now?" or, "the class of man who has served us as analyst has sufficed for our needs; he costs only 2*l.* a week; why burden ourselves with a more expensive, even if a more skilled man?" And when trade declines, he naturally shrinks from spending money. It is the policy of "penny-wise and pound-foolish."

In conclusion, let me make one more remark. It is that the scientific curiosity of to-day often becomes the trade necessity of to-morrow. A scientific friend of mine once drew my attention to the fact that most of the changes which have been introduced in industry have had their origin in the universities. Why? Because the investigator is unfettered. If a man sets himself to improve an existing process, he very likely may succeed, but he will not effect a revolution in manufacture. The purely scientific investigator who is free to follow indications of no apparent commercial import has not infrequently made discoveries of a radical nature, which have entirely changed some particular industry. I do not recommend the one to the exclusion of the other; both are best; and both are best attained by an intimate association between the universities and the chemical works. The investigator often learns much by the study of industrial processes. The chemical manufacturer who is keenly alive to his own interests will not fail to keep himself in touch with every discovery, however little it appears to be connected with his own industry.

To quote from the "Rules of Political Conduct," written for the people of Japan thirteen hundred years ago: "The imperative duty of man is to sacrifice his private interest to the public good. Selfishness forbids co-operation, and without co-operation there cannot be any great achievement."

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I.—PLANT, APPARATUS AND MACHINERY.

ENGLISH PATENTS.

Steam Meter. H. E. Newton, London. From the Farbenfabriken vormals F. Bayer and Co., Elberfeld. Eng. Pat. 21,471, Oct. 6, 1903.

THE steam is passed through a closed vessel, over the outlet of which a hollow truncated cone is arranged. In the opening of the cone, a float is arranged to work; it is supported by a wire working through the cover over a pulley and balanced by a weight. Attached to this wire, and on the outside of the vessel, is a pen or pointer which operates in connection with a moving scale. From the indications of the pointer, the position of the float and consequently the area of the discharge opening can be deduced, and from the pressure, recorded on a registering gauge, the quantity of steam passing can be calculated.

—W. H. C.

Condensing and Cooling of Gases, Vapours, and Liquids.

A. F. Browne and D. Chandler, London. Eng. Pat. 5485, March 5, 1904.

THE gases, &c., to be condensed and cooled are led through a chamber or series of chambers, the outer surfaces of which are exposed to the air, so that radiation and consequently cooling may take place. Within each chamber is a series of other chambers or pipes, through which a current of air is transmitted. The interior of the walls of these pipes is kept constantly wetted by a film of water, supplied in the form of spray by an atomiser, or drawn up by capillary attraction by cotton wicks or cloths attached to wire netting and dipping into water. A number of shallow trays filled with water are superposed one over the other in these pipes, so that the water overflows from each pipe to the next lower one. A partial vacuum may also be maintained in the pipes. In this way, the heat abstracted from the gases to be cooled, is rendered latent by the continuous evaporation of a film of water, in the air current.—W. H. C.

UNITED STATES PATENTS.

Centrifugal Separator. H. McCornack, Westchester, Pa. U.S. Pat. 766,837, Aug. 9, 1904.

A SUSPENDED shaft, to which a tubular centrifugal vessel is coupled, is supported and enclosed by the upper portion of a frame, the lower part of which forms a fixed casing below the coupling and surrounding the depending centrifugal vessel. The casing supports the lower end of the centrifugal vessel and has diverging walls, so that the latter, when uncoupled, can be tilted sufficiently to enable it to be freely lifted out of the casing.—E. S.

Drying Apparatus. H. Baetz, St. Louis, Mo. U.S. Pat. 767,198, Aug. 9, 1904.

WITHIN a suitable casing are contained a blower, one or more pairs of superposed and spaced air chambers, with steam heater, the adjacent faces of the chambers on either side of the open space separating them being provided with nozzles for discharge of the air; exhaust pipes leading from

the casing back to the blower; also suitable feed mechanism for advancing the articles to be dried, through the space separating the chambers in the path of the air current issuing from the nozzles.—E. S.

Drying Apparatus. F. E. Allen, Boston, Mass. U.S. Pat. 767,727, Aug. 16, 1904.

A VERTICAL series of horizontal conveyors, between each of which are horizontal radiators, is arranged in a casing. The material to be dried, is fed into the top from a hopper and passes downwards over the conveyors, to the outlet at the bottom. Means are provided: for supplying a suitable heating agent to the radiators; for agitating the material; for forcing a current of air across the conveyors; and for withdrawing the moisture-laden air from the apparatus.

—W. H. C.

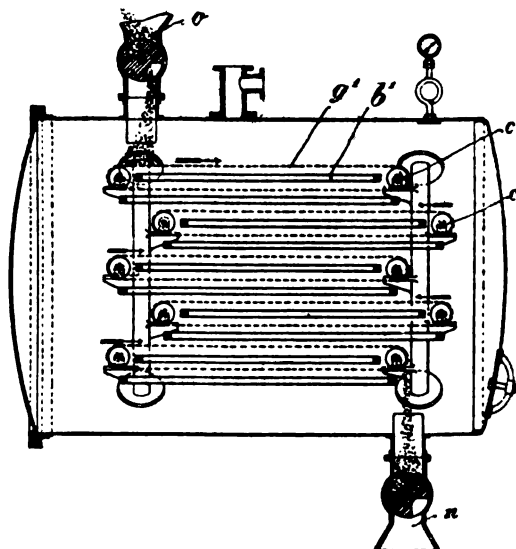
Exhausting Vapours or Gases; Apparatus for — V. Schwabinger, Oggersheim, Germany. U.S. Pat. 767,502, Aug. 16, 1904.

SEE Eng. Pat. 5110 of 1902; this J., 1903, 407.—T. F. B.

FRENCH PATENTS.

Vacuum Drier; Continuous — R. Haack and the Surthor Maschinen-Fabr. vorm. H. Hammerschmidt. Fr. Pat. 341,672, March 26, 1904.

THE material to be dried is introduced at O and carried, on the endless band conveyor *g*¹ in the direction of the arrows



to the outlet *n*. The drying is effected by the heating boxes *b*.—W. H. C.

Vapours of Volatile Solvents; Process and Apparatus for Collecting, Drying, and Recovering — from the Air. E. Bouchaud-Praceiq. Fr. Pat. 341,690, March 26, 1904.

THE air is automatically aspirated through a filter, then through a drying tower, and finally passes into an absorbing chamber filled with porous material through which percolates a suitable liquid for absorbing the volatile solvents. The method is particularly applicable to the vapours of alcohol and ether. The absorbed vapours are recovered as solvents by suitable distillation of the absorbing liquid.—W. P. S.

II.—FUEL, GAS, AND LIGHT.

Flame of Different Fuels; Calorific Value of the —. P. Mahler. Rev. Univ. des Mines, 1904, 1. Proc. Inst. Civil Eng., 1904, 156, 47—48.

In the following table the flame temperature is that obtainable when the fuel is burnt with air at 0° C. and 760 mm. :—

	Calorific Power.		Flame Temperature.
	Water Condensed.	Water as Vapour.	
	Calories.	Calories.	° C.
Oak wood, Lorraine.....	4660	4570	1865
Peat, Bohemia.....	5900	5590	2020
Lignite Trifail, Styria.....	6150	6370	1960
Flaming coal, Blanzy.....	8550	8090	1990
" Decazeville.....	7840	7530	1960
Oxidised (weathered) coal, Commen- mentry.....	6380	6200	1960
Gas coal, Commenmentry.....	8410	8110	1950
" Bethune.....	8670	8380	1990
" Lens.....	8740	8450	2010
Coking coal, St. Etienne.....	8860	8530	2010
Smithy coal, Roche la Molière.....	8860	8600	2030
Semi-bituminous coal, Auzin.....	8660	8430	1980
Anthracite coal, Commenmentry.....	8460	8280	2030
" Kebao, Tonkin.....	8530	8370	2020
" Creusot.....	8690	8480	2010
Pennsylvanian anthracite.....	8260	8140	2000
Ethyl and methyl alcohol.....	..	..	1700
Amyl alcohol.....	..	..	1850
Crude American petroleum.....	..	10,400	2000
American petroleum spirit.....	..	10,270	1920
" refined petroleum.....	..	10,230	1660
Hydrogen.....	..	..	1960
Carbon monoxide.....	..	..	2100
Methane.....	..	..	1850
Acetylene.....	..	..	2350
Illuminating gas, average.....	..	..	1950
Water-gas in industrial use.....	..	..	2000

The true measure of value of a fuel is not the flame temperature, however, but the calorific power; for example, the flame of peat is hotter than that of St. Etienne coal, but the body of flame is much larger in the case of the coal than in that of the peat. 100 grms. of the peat yield 28 vols. of gas at 2000° C., whilst the same weight of coal yields 44 vols. of gas at the same temperature. From a thermometric point of view, the use of hot blast for improving the flame would appear to be more efficacious in furnaces fired with coal than in those using fuels of an inferior character.

—A. S.

Magnetite Arc-Lamp. C. P. Steinmetz. Elect. World and Eng., 1904, 43, 974; J. Gasbeleucht., 1904, 47, 751—753.

THE lamp is provided with a copper positive electrode, which does not require renewal, and a negative electrode consisting substantially of magnetite (Fe_3O_4). The electrodes themselves take no part in the light emission, which is due solely to the luminous arc, containing volatilised magnetite. In the preliminary experiments, which led to the construction of the lamp, it was ascertained that, in luminous-arc lamps, the substance which conducts the arc is given off more rapidly from the negative than from the positive electrode, and, impinging upon the latter, heats

it highly. If the positive electrode be a good enough heat-conductor and of suitable dimensions, the heat developed is led away and the electrode is not consumed. If it has too great a heat conductivity, material from the negative electrode is deposited upon it. Thus, in the magnetite lamp, if the copper electrode is not thick enough to conduct away a sufficient proportion of the heat generated, it is destroyed; and, on the other hand, if too thick, drops of magnetic oxide condense upon it. The electrodes are therefore so chosen as to avoid both difficulties, and the positive electrode forms a permanent, fixed part of the lamp. The metals of the iron group give a brilliantly luminous arc, emitting white light; but electrodes made of the metals themselves have little durability, whereas the oxides, being incombustible, are suitable for use. Of these oxides, magnetite gives the best results, and it is found that a steadier arc and a higher efficiency result, if titanium and other compounds are mixed with the magnetic oxide. The electrodes are manufactured in compact form, and it is claimed that in use they are consumed at the rate of only 0.8 to 1 mm. per hour. An electrode 200 mm. long therefore lasts about 150—200 hours; but with a slight decrease in efficiency, the durability can be increased to 500—600 hours. The life of the electrodes is then about equal to that of an ordinary glow lamp. The most favourable length of arc is 20—30 mm., and this is maintained by means of a simple automatic regulating device. According to A. Holmes, a 320-watt magnetite lamp emits rather more light than an ordinary 340-watt lamp with open arc, or a 460-watt lamp with enclosed arc. The lamp is adapted for use with a direct current; if an alternating current be employed, there is a considerable diminution in efficiency.

—H. B.

ENGLISH PATENTS.

Gas and Air; Apparatus for the Production of Mixtures of —. H. H. Lake, London. From Selas G. m. b. H., Berlin. Eng. Pat. 17,789, Aug. 17, 1903.

APPARATUS for the production of gaseous mixtures, by the separate suction of gas and air, is provided with a regulating device for automatically varying the amount of the mixture produced in accordance with the consumption, the said device being interposed between the suction and forcing chambers and subjected to the pressure in the outlet service main of the apparatus in such a manner that when alterations in the pressure occur, a communication between the suction and forcing chambers is opened more or less. The effect is that the operation of the suction apparatus (piston pumps, blowers, or the like) never varies, the regulation being effected merely by repumping more or less of the already formed mixture back through the apparatus from the forcing side. The regulating valve between the suction and forcing chambers may be actuated by means of a float, diaphragm, or the like connected to a branch pipe from the forcing side of the apparatus.—H. B.

Gas Producers; Suction —. E. Capitaine, Frankfort-on-the-Maine, Germany. Eng. Pat. 2547, Feb. 2, 1904.

A VERTICAL water-vaporiser is arranged concentrically above the combustion chamber inside the shell of the producer, the hot gases flowing up through the vaporiser. The annular space between the vaporiser and the shell is utilised as a storage chamber for the charging fuel, which serves as a heat insulator and falls into the combustion chamber as required.—H. B.

Gas Retorts; Inclined —. E. Derval, Paris. Eng. Pat. 21,964, Oct. 12, 1903.

THE bottom of the inclined retort is provided with one or more longitudinal ribs extending the whole of its length, in combination or not with a series of channels, hollows, or projections at the lower end of the retort, for the purpose of facilitating the disengagement of gas, preventing the coal from slipping down to the lower end during the distillation, and rendering the discharge of the coke easier. The effectiveness of the non-slipping devices may be increased by employing curved retorts, as described in U.S. Pat. 762,578 (this J., 1904, 745).—H. B.

Gas-Producing Plant for Heating Retort Furnaces. H. Poetter, Dortmund, Germany. Eng. Pat. 8998, April 19, 1904.

A PLANT for the production of coal-gas, having beneath the retorts a gas producer which generates water-gas and producer-gas, both for heating the retorts and for admixture with the retort gases, is so arranged that the outlet flue for the water gas and the outlet flue for the producer-gas open into a pipe leading to the retort space, and are also connected with the gasholder by a branch pipe, the pipe junctions being controlled by three-way valves in such manner that when the valves are in one position the producer-gas passes exclusively to the retort setting, and when in the other position the water-gas passes partly to the retort furnace and partly to the gasholder.—H. B.

Gas Producers. H. Poetter, Dortmund, Germany. Eng. Pat. 14,383, June 25, 1904.

In order to keep the fire grate cool and to provide for an automatic generation of steam, cooling tubes, having lateral perforations through which the cooling water may overflow into collecting troughs below, are arranged beneath the fire-bars, and may be adapted to support the fire-bars. The air-blast pipe is arranged below the cooling tubes. An auxiliary grate may be provided to support the fuel whilst the grate proper is removed for cleaning or repairs.—H. B.

Refuse-consuming and Gas-producing Furnaces. L. Tobiansky. Eng. Pat. 12,361, May 31, 1904. XVIII. B., page 878.

Gas Purifying Plants. J. D. L. Klein, Copenhagen. Eng. Pat. 14,465, June 27, 1904.

THE purifiers are connected together by separately valved pipes in such a manner that the gas may be directed through any one or more of the purifiers, and in any desired order. The grids for supporting the purifying material are made of horizontal parallel bars, the cross section of which is diamond-shaped or which are roof-like on the top. The bars are spaced far apart, experience having shown that the purifying material, instead of falling through, forms arches from bar to bar, the inclined top surfaces of the bars serving as abutments. The lowest grid of each purifier is of the usual closely-set form, and is covered with a layer of bark.—H. B.

UNITED STATES PATENTS.

Coke-Oven; Horizontal — H. Poetter, Dortmund, Germany. U.S. Pat. 766,898, Aug. 9, 1904.

SEE Eng. Pat. 16,807 of 1902; this J., 1903, 899.—T. F. B.

Gas and Coke; Process of Manufacturing — J. C. H. Stut, Oakland, Cal. U.S. Pat. 766,400, Aug. 2, 1904.

A BODY of coal, contained in one of a series of parallel contiguous ovens, is heated to incandescence by passing air over and up through the burning fuel; the air supply is shut off and crude oil is fed upon the surface of the fuel, whereby oil-gas is generated and oil residue is deposited; then steam is introduced from below, the water-gas produced mingling with the oil-gas at the surface of the fuel. Simultaneously a body of coking coal, contained in a contiguous oven, is carbonised by the heat transmitted through the dividing wall, and the coal-gas produced is led along with the water-gas and oil-gas through a fixing chamber. The operation is then reversed by filling the second oven with fresh coal and introducing steam below and oil above the fuel as already stated, whilst the heat transmitted through the dividing wall produces coke and coal-gas from the coal and oil residue in the first oven, the various gases being mingled and fixed as before. See following abstract.—H. B.

Gas and Coke; Apparatus for the Manufacture of — J. C. H. Stut, Oakland, Cal. U.S. Pat. 766,553, Aug. 2, 1904.

THE apparatus consists of a series of parallel contiguous ovens, connected to carburetters and regenerators, suitable for carrying out the process described in the preceding abstract.—H. B.

Gas; Process of Manufacturing — J. C. H. Stut, Oakland, Cal. U.S. Pat. 766,554, Aug. 2, 1904.

AN oven, having a layer of incombustible porous material at the bottom, is heated to redness. Crude oil is injected on to the incandescent porous material, forming oil-gas and a carbonaceous deposit, and, after the latter has become coked, it is consumed in the production of water-gas by passing steam up through it. The oil-gas and water-gas are mixed. The heat transmitted through the walls of the oven may be employed in producing coal-gas from a body of coking coal in a contiguous connected oven, the several gases being mixed together. See the following and the two preceding abstracts.—H. B.

Gas and Coke; Apparatus for Making — J. C. H. Stut, Oakland, Cal. U.S. Pat. 766,555, Aug. 2, 1904.

THE apparatus consists of contiguous ovens, having perforated hearths and connected to carburetters and regenerators, suitable for carrying out the process described in the preceding abstract.—H. B.

Gas [for Oil Engine]; Apparatus for Generation of — W. A. Salisbury, Assignor to C. O. Goss, Winona, Minn. U.S. Pat. 766,580, Aug. 2, 1904.

THE generator consists of a number of retorts, each having an independent oil-supply under pressure; a gas-mixing chamber, having independent valved communication with each retort; burners beneath the retorts and gas-mixing chamber, communicating with the latter and with the air; a main mixing chamber communicating with the gas chamber, and having an exit and hot-air supply controlled by valves carried by a common stem; and a governor mounted on the same stem and actuated by the engine fed with the gas produced.—H. B.

Gas Producer. J. R. George, Assignor to Morgan Construction Co., Worcester, Mass. U.S. Pat. 766,880, Aug. 9, 1904.

SEE Eng. Pat. 16,263 of 1903; this J., 1903, 1189.—T. F. B.

FRENCH PATENTS.

Coke; Process and Apparatus for Extinguishing and Bleaching — E. A. Moore. Fr. Pat. 341,499, March 21, 1904.

SEE U.S. Pats. 755,154 and 755,155 of 1904; this J., 1904, 436.—T. F. B.

Generator for Low-Grade Gas. Lerouge, Formas, & Cie. First Addition, dated March 2, 1904, to Fr. Pat. 339,817, Jan. 22, 1904 (this J., 1904, 710).

THIS addition refers to an automatic rubbish grate that is mounted on an axis, and capable of oscillating to allow of the removal of portions of ash that are too large to pass the long-toothed wheel which regulates the discharge of ordinary-sized cinders into the ash-pit.—W. C. H.

Gas Generators; Arrangement for the Automatic Supply of Water and Steam in — F. L. A. Pagny. Fr. Pat. 341,402, March 17, 1904.

EACH aspiration of gas by the piston causes a certain amount of water, kept at constant level, to flow from a tank into a receptacle inside the upper part of the scrubber, from which receptacle the water falls into the scrubber, whilst by the weight of the water drawn in, the receptacle works a lever and spring arrangement which controls the gas valve.—W. C. H.

Generators for Low-Grade Gas. Gay and Vivier. Fr. Pat. 341,414, March 19, 1904.

IN the type of gas-generator in which the steam required is derived from a vaporiser arranged in the upper part of the generator, it is found that a sediment from the water collects in the vaporiser. To allow of the easy removal of such sediment, it is proposed to incline the bottom of the vaporiser, so that the sediment may collect in the lowest part, and be removed through a plug-hole.—W. C. H.

Lighting and Heating Gas; Apparatus for the Production of —. W. Lord. Fr. Pat. 341,708, March 28, 1904.

A HOT-AIR engine, driven by means of a Bunsen burner, pumps air through a carburetter consisting of a chamber containing vertical partitions covered with flannel and saturated with petrol or the like, between which partitions the air pursues a tortuous course. An automatic device for regulating the air pressure is interposed between the engine and the carburetter. It consists of a cylindrical vessel into which the air is pumped, a column of water, on which a ball floats, being maintained within the cylinder at a height depending upon the air-pressure therein. The ball is linked up by means of levers to the cock of the pipe which supplies gas to the Bunsen burner of the engine, so that a reduction in air pressure at once causes an increase in the speed of the engine, and *vice versa*. The air, on leaving the cylinder, passes through the cooling-jacket of the hot-air engine before passing through the carburetter.—H. B.

Ammonia and Cyanogen Compounds; Obtaining Simultaneously — by Treatment of [Coal] Gas, with Partial Regeneration of the Scrubbing Materials. W. Feld. Fr. Pat. 341,614, Jan. 18, 1904.

LIGHTING gas is scrubbed with a solution of 280 grms. of ferrous sulphate crystals, and from 1000 to 1300 grms. of calcium chloride, for each 100 cb. m. The solution produced, containing calcium ferrocyanide and ammonium chloride, with a deposit of calcium carbonate and sulphate, is treated with lime and steam to obtain ammonia (free from sulphide) and calcium chloride, suitable for re-use. From the turbid solution the cyanogen may be precipitated as Prussian blue, and the mud, separated by filtration, after addition of an iron salt, may be again used in the scrubber. Several formulæ are given, showing the use and proportions of various scrubbing agents, including ferrous hydroxide, or ferrous or manganous sulphate in combination with magnesium or calcium chloride or the like, adapted to be used with gas of certain stated types. Ger. Pats. 41,080 and 112,459 are referred to. Compare Eng. Pat. 10,876, 1902; this J., 1903, 691.—E. S.

Tar from Water-Gas; Process of Utilising the —. L. Scholvien. Fr. Pat. 340,995, March 7, 1904. III., next column.

Tarry Vapours; Recovery of — in the Manufacture of Carbon Electrodes. Soc. Franc. des Electrodes. Fr. Pat. 341,698, March 29, 1904.

THE gas and vapours, issuing from the furnace in which the electrodes are baked, are blown by means of a fan through a series of condensing pipes and thence to the chimney. The tar is thus condensed and recovered, whilst the gas passes on.—H. B.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM, AND MINERAL WAXES.

ENGLISH PATENT.

Coal Tar; Distillation of —. C. Weyl, Mannheim, Germany. Eng. Pat. 12,123, May 27, 1904.

THE tar is heated in a horizontal, cylindrical boiler or still, furnished with several narrow tubes fixed in its ends; hot furnace gases circulate through these tubes and heat the tar, whilst a high vacuum is maintained in the still, so that the boiling point of the tar at the end of the distillation is about 270°–280° C., thereby preventing coking, as well as accelerating the distillation.—T. F. B.

UNITED STATES PATENTS.

Pine Wood; Process of Distillation of Crude Oils from —. J. C. Mallouee, Charlotte, N.C., Assignor to J. J. Mallouee, Crichton, Ala. U.S. Pat. 766,717, Aug. 2, 1904.

PINE wood is heated in a retort by means of a perforated steam coil, and also by external heating; the distillate is

collected in three fractions, the first consisting of oils of specific gravities of 0.855 to 0.92, the second from 0.92 to 0.96, and the last fraction of oils above 0.96 sp. gr., and having an average specific gravity of 1.015. These three fractions are further fractionated both by steam and external heating.—T. F. B.

Wood Distilling Apparatus. B. Viola, New York, Assignor to R. G. G. Moldenke, Watchung, N.J. U.S. Pat. 767,090, Aug. 9, 1904.

A CYLINDRICAL retort is mounted in a furnace, at a slight inclination to the horizontal, and in such a manner that it can be rotated. The lower end of the retort is connected by an air-tight joint with a fixed discharge chamber, which is provided with discharge pipes. The upper end of the retort is connected, also by an air-tight joint, with a curved elbow piece, which leads the products of distillation to a vertical receptacle, provided with a stirrer. The retort is also provided with a stirrer. The retort, elbow-piece, and "vertical receptacle" are all of approximately the same diameter.—T. F. B.

Wood Distilling Apparatus. B. Viola, New York, Assignor to R. G. G. Moldenke, Watchung, N.J. U.S. Pat. 767,091, Aug. 9, 1904.

THE apparatus is similar to that described in the preceding specification, with the addition of an arrangement for raking the non-volatile residue from the retort down a shoot into a water-tank.—T. F. B.

FRENCH PATENTS.

Tar from Water-Gas; Process for Utilising the —. L. Scholvien. Fr. Pat. 340,995, March 7, 1904. J.

THE tar obtained in the carburetting of water-gas is distilled till the residue consists only of pitch. The distillate is treated with acid and then with alkali, and distilled as long as the distillate remains clear; any further distillates are treated in the same manner as the original tar, and the resulting products mixed with the clear distillate. The resulting liquid has a specific gravity of 0.82 to 0.9, flashing point 30° C., and consists principally of unknown hydrocarbons, with small quantities of toluene, xylene, mesitylene, and traces of naphthalene; it contains no sulphur or phenols, and can be used as a solvent for gums, resins, fats, &c.—T. F. B.

Denaturation of Industrial Alcohol by Carbialine and its Compounds. A. Leoni, A. Pelizza, and E. Stringa. Fr. Pat. 341,617, Feb. 2, 1904. XVII., page 878.

Soap [containing Benzene]; Manufacture of —. J. F. G. de Roussy de Sales. Fr. Pat. 341,568, March 24, 1904. XII., page 872.

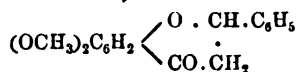
Distillation of Fats, Oils, and Tars of all kinds in Vacuo; Continuous Process for the —. G. Bokelberg and J. Sachse. Fr. Pat. 341,571, March 24, 1904.

SEE Eng. Pat. 7204 of 1904; this J., 1904, 655.—T. F. B.

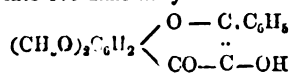
IV.—COLOURING MATTERS AND DYESTUFFS.

Galangin; Synthesis of —. St. v. Kostanecki, v. Lampe, and J. Tambor. Ber., 1904, 37, 2803–2806.

2'-HYDROXY-4'.6'-DIMETHOXYCHALKONE, $(\text{CH}_3\text{O})_2(\text{OH})\text{C}_6\text{H}_2\text{CO}\cdot\text{CH}:\text{CH}\cdot\text{C}_6\text{H}_5$, was converted, by boiling with alcoholic hydrochloric acid, into 1.3-dimethoxyflavanone—



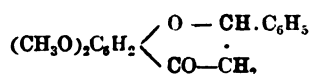
This was treated with amyl nitrite and hydrochloric acid, yielding an isonitrosoderivative, which was converted in the usual manner into 1.3-dimethoxyflavonol—



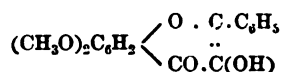
On demethylation with hydriodic acid, this forms Galangin, which is 1.3-dihydroxyflavonol. It was absolutely identical in properties with the product from the galanga-root. In strong sulphuric acid solution it shows blue fluorescence. On alumina mordant it dyes in fine yellow shades, though not very strongly.—E. F.

Galangin; An Isomeride of —. F. Dobrzynski and St. v. Kostanecki. Ber., 1904, 37, 2806—2809.

By the action of benzaldehyde on gallacetophenonedimethylether, 2'-hydroxy-3',4'-dimethoxychalkone, $(\text{CH}_3\text{O})_2(\text{OH})\text{C}_6\text{H}_2\text{CO}\cdot\text{CH}:\text{CH}\cdot\text{C}_6\text{H}_5$, is obtained. By treatment with alcohol and dilute sulphuric acid, this is converted into 3.4-dimethoxyflavonone—



the isonitroso derivative of which, when boiled with dilute mineral acid, yields 3.4-dimethoxyflavonol—

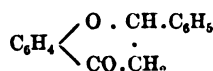


On demethylation with hydriodic acid, this yields 3.4-dihydroxyflavonol, an isomeride of Galangin. The product dyes strongly on mordanted fabrics. On alumina mordant it gives orange-yellow shades. It is readily soluble in aqueous alkalis, with a reddish-yellow colour. In concentrated sulphuric acid it dissolves to a yellow solution.

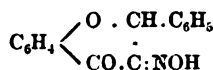
—E. F.

Flavonol; Synthesis of —. St. v. Kostanecki and W. Szobranski. Ber., 1904, 37, 2819—2820.

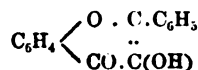
FLAVANONE—



(this J., 1904) is nitrosated in the usual manner to form isonitrosoflavonone—



On boiling with dilute mineral acids this yields flavonol—

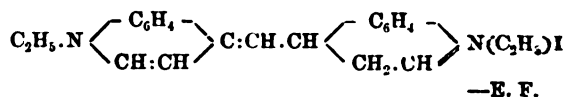


Flavonol forms colourless needles almost insoluble in cold sodium hydroxide solution, but soluble with a yellow colour on warming, forming a sodium salt which crystallises in yellow needles on cooling. It dyes in bright yellow shades on an alumina mordant.—E. F.

Cyanine Dyestuffs; Constitution of —. A. Miethe and G. Book. Ber., 1904, 37, 2821—2824.

DIETHYLECYANINE was obtained by acting on a mixture of 2 mols. of quinoline-ethyl iodide and 1 mol. of lepidine-ethyl iodide with 2 mols. of alkali hydroxide in alcoholic solution. The product forms dark-green needles, soluble with difficulty in alcohol, almost insoluble in water, and having the formula, $\text{C}_{23}\text{N}_3\text{N}_2\text{I}$. The dyestuff is quite similar in its reactions to Ethyl Red (this J., 1203, 712). The iodine atom can be replaced by other acid radicles through the medium of the corresponding silver salt. The nitrate produced in this way is also exceptionally soluble in water, and has a very powerful sensitising action on a silver-bromide-gelatin plate. Diethylecyanine resembles Ethyl Red further in forming a di-iodo addition product from which

iodine is not set free by dilute hydrochloric acid or by solution in acetone. The authors therefore assign to Diethylecyanine the constitutional formula—



—E. F.

Dibenzalacetone and Triphenylmethane. V. A. v. Baeyer and V. Villiger. Ber., 1904, 37, 2848—2880. (See this J., 1902, 607, 1826; 1903, 1124; 1904, 318.)

THE authors have succeeded in preparing stable forms of the true colour bases (phenylated quinone-imines) of various triphenylmethane dyestuffs, and their results show that Nietzki's quinone formula represents most correctly the constitution of the dyestuffs. Since, now the true quinonoid colour bases have been isolated, the old system of nomenclature is not a rational one, the following new method is proposed, 7.7-diphenylquinomethane, the root substance of aurin, discovered by Bistrzycki (this J., 1903, 901) being taken as the basis. The name fuchson is proposed for this substance, fuchson-imine for the imide derived from it, and fuchson-imonium salts for the salts of the latter. The following are examples of the new system:—

Old Name.	New Name.
Aurin group:—	
Diphenylquinomethane...	Fuchson.
Benzaurin.....	Hydroxyfuchson.
Aurin.....	Dihydroxyfuchson.
Colour Bases of Carbinols not completely alkylated:—	
Imide of Diphenylquinomethane.....	Fuchson-imine.
Colour Base of Döbner's Violet.....	Aminofuchson-imine.
Homolka's Fuchsin base.	Diaminofuchson-imine.
Colour base of triphenyl-pararosaniline.....	Diphenylaminofuchsonphenylimine.
Colour Salts or Dyestuffs:—	
Hydrochloric acid colour salt of aminotriphenylcarbinol.....	Fuchson-imonium chloride.
Döbner's Violet.....	Aminofuchson-imonium chloride.
Malachite Green.....	Tetramethylaminofuchson-imonium chloride.
Viridine.....	Phenylaminofuchsonphenylimonium chloride.
Parafuchsin.....	Diaminofuchson-imonium chloride.
Hexamethyl Violet.....	Hexamethyldiaminofuchson-imonium chloride.
Ariline Blue.....	Diphenylaminofuchsonphenylimonium chloride.
New Fuchsin.....	Diaminotrimethylfuchson-imonium chloride.

p-Dimethylaminotriphenylcarbinol was obtained by condensing benzophenone chloride with dimethylaniline in presence of zinc chloride. After purification it crystallised in tufts of colourless needles melting at 92°—93° C., easily soluble in chloroform and benzene, somewhat less soluble in alcohol and ether, and only slightly soluble in petroleum spirit. It dissolves in acids with an orange-red colour and dyes tannin-mordanted cotton orange-red. *p*-Monomethyltriphenylcarbinol was obtained by condensing diphenylcarbinol with methylaniline. It also dissolves in acids with an orange-red colour.

Döbner's Violet.—Döbner prepared di-*p*-aminotriphenylcarbinol from aniline hydrochloride, nitrobenzene, benzotrichloride and iron filings, but did not obtain a pure product. The authors' method consists in converting di-*p*-aminotriphenylmethane into its diacetyl derivative, treating the latter with sulphuric acid and manganese dioxide to obtain the diacetyl-carbinol and separating the carbinol by hydrolysis with 30 per cent. sulphuric acid. Di-*p*-aminotriphenylcarbinol loses water below its melting point, which is 173°—175° C., when the compound is heated fairly quickly, and 167°—168° C. when the heating is more gradual. It is slightly soluble in ether and cold benzene, more readily in alcohols and boiling benzene or xylene, and easily soluble in pyridine. It is also somewhat soluble in hot water, but

considerably less so than pararosaniline. When warmed with acids it is readily converted into the corresponding aminofuchsonium salts. These colour-salts crystallise well, and are only slightly soluble in cold water. When shaken with caustic soda solution and ether or benzene, they yield the colour-base of Döbner's Violet (aminofuchsonimine), which resembles in properties Homolka's Fuchsine base, but is yellower and much more unstable than the latter. In benzene solution the colour-base readily polymerises, forming a violet powder.

Colour-base of Viridine (*p*-Phenylaminofuchsonphenylimine).—This was prepared by heating on the water-bath a mixture of dianisylphenylcarbinol, aniline, and benzoic acid and purifying the product by means of its picrate, from which the base is set free by dilute caustic soda solution. The base melts at 166°–168° C., dissolves with difficulty in ether and cold benzene to a brownish-red solution, and is more easily soluble in hot benzene. It has similar properties to the fuchsonphenylimine previously described (this J., 1904, 818). On treatment with alcohols or aniline, decolorisation takes place, the alkyl ethers or the anilide of diphenylaminotriphenylcarbinol being produced; the colourless carbinol is also produced by treatment with very dilute acids. Reducing agents convert it into the leuco-base. The *p*-phenylaminofuchsonphenylimonium salts give green solutions.

Fuchson-imines of Parafuchsine and New Fuchsine (Homolka's Base).—The authors confirm the statements of Homolka and Hantzsch as to the behaviour of the bases. They can be dissolved unaltered in water and re-precipitated by caustic soda, if the experiment be carried out quickly, but if the aqueous solution be allowed to stand, a precipitate of a faint violet colour is deposited, consisting mainly of the carbinol. With sodium chloride and nitrate the phenylimines give the corresponding dyestuffs; with ethyl alcohol, and more readily, methyl alcohol, the alkyl ethers of the carbinols; and with aniline, the anilides of the carbinols.

Colour Base of Triphenylpararosaniline Blue (Diphenylaminofuchsonphenylimine).—This was prepared in a similar manner to the colour-base of Viridine, by heating together a mixture of *p*-trianisylcarbinol, benzoic acid, and aniline, an approximately quantitative yield of the imonium benzoate being obtained. The pure colour-base forms a black crystalline powder, easily soluble in pyridine and crystallising from boiling xylene in aggregates of plates melting at 237°–238° C. It has similar properties to the other phenylimines.—A. S.

Fluorazones: a New Group of Dyestuffs formed by Melting Amino-azo Dyestuffs with Resorcinol. L. Paul. Chem.-Zeit., 1904, 28, 765–772.

The author finds that the reaction which takes place when amino-azo dyestuffs are melted with resorcinol is quite different from that which occurs when they are heated with phenol. Two new groups of dyestuffs are formed, according to whether the amino-azo dyestuff is heated with resorcinol alone or in presence of a second component, such as aniline or its derivatives. It is possible to so carry out the reaction that only dyestuffs of the first group (Fluorazones) are formed, whilst these when heated with aniline, &c., are converted into dyestuffs of the second group. The Fluorazones appear to be of no technical value. The dyestuffs of the second group differ in character, according to whether the benzene ring in the mixed amino-azo dyestuff contains a substitution group in the para position or not. For example, when the benzene ring contains a hydroxyl or an amino group in the para position, the Fluorazones obtained, give, when heated with amines at 120°–150° C., red dyestuffs very similar to those of the Magdala Red group. When the benzene ring contains no substitution group in the para position, the reaction with amines fails altogether at 120°–150° C., but at 180°–190° C., a different reaction takes place, Rosinduline derivatives being produced. The dyestuffs similar to Magdala Red, mentioned above, are also converted into Rosinduline derivatives when heated to 180°–190° C. For example, starting with Meldola's base (*p*-aminobenzene-azo- α -naphthylamine), Aminorosinduline, a red basic dyestuff, is

finally obtained, probably useful for printing cotton goods. On cotton mordanted with tannin and antimony, it gives a bluish-red shade, fast to soaping and light, distinctly superior to that obtained with Safranine or Magenta. The method of preparation is as follows:—10 grms. of resorcinol and 5 grms. of aniline are heated to 160° C., and 5 grms. of Meldola's base and 2.6 grms. of aniline hydrochloride rapidly added. The melt is extracted with dilute hydrochloric acid, and the bluish-red dyestuff, which separates on standing, is filtered off. In the filtrate the base is precipitated by ammonia, filtered off, redissolved in 10 per cent. acetic acid, again precipitated with ammonia, and so on, until the precipitate dissolves readily in hot water. The yield of Aminorosinduline obtained in this way was 10 grms.; the residue insoluble in hydrochloric acid, weighed 1.7 grms.—A. S.

Sensitisers [Dyestuffs]: Supplementary. — A. Miethe. XXI., page 881.

ENGLISH PATENTS.

Sulphurised [Sulphide] Dyestuffs; Manufacture of Yellow, Orange-Yellow to Orange. — O. Imray, London. From Farbwerke vorm. Meister, Lucius und Brüning, Höchst-on-the-Maine. Eng. Pat. 21,800, Oct. 9, 1903.

The reaction product of 1 mol. of *m*-phenylenediamine and 1 mol. of carbon bisulphide when heated with sulphur at 170°–195° C., or with sulphur and sodium sulphide to 120° C., gives dyestuffs dyeing unmordanted cotton clear yellow shades. If, previous to heating with sulphur, the parent compound be heated to about 235° C., evolution of gas occurs, and the product, when heated with sulphur to 220° or 250° C., gives yellow to orange dyestuffs according to the temperature employed. When these latter dyestuffs are heated with sodium sulphide to 130° C., the shade of the product is somewhat modified. (See U.S. Pat. 760,110 of 1904; this J., 1904, 712.)—T. F. B.

Sulphur Dyes [Sulphide Dyestuffs]. H. H. Lake, London. From K. Oehler, Offenbach-on-Maine, Germany. Eng. Pat. 12,270, May 30, 1904.

SEVENTY-FIVE parts of 2,4-dinitrophenyl-3'-chloro-4-hydroxy-5'-tolylamine (obtained by condensing 1,3,4-dinitrochlorobenzene with *p*-amino-*o*-chloro-*o*-cresol) are heated with 800 parts of sodium sulphide, 120 parts of sulphur, and 200 parts of water, with reflux condenser, at about 100° C., for about 20 hours, and the product is evaporated to dryness at 105°–110° C.; the resulting dyestuff gives fast deep blue shades on cotton from its solution in sodium sulphide.—T. F. B.

UNITED STATES PATENTS.

Indigo; [Electrolytic] Manufacture of Brominated. — A. Schmidt and R. Müller, Assignors to Farb. vorm. Meister, Lucius und Brüning, Höchst-on-the-Maine, Germany. U.S. Pat. 765,996, July 26, 1904.

SEE Fr. Pat. 322,348 of 1902; this J., 1903, 360.—E. B.

Wool Dye [Azo Dyestuff]; Dark Brown. — A. L. Laska, Assignor to K. Oehler, Anilin- und Anilinfarben Fabr., Offenbach-on-the-Maine, Germany. U.S. Pat. 767,069, Aug. 9, 1904.

Azo dyestuffs, which give blackish-brown shades on wool after chroming, are obtained by combining diazotised naphthylamine sulphonic acids with *m*-hydroxydiphenylamine.—T. F. B.

Mordant Dye [Azo Dyestuff]; Brown. — A. L. Laska, Assignor to K. Oehler, Anilin- und Anilinfarben Fabr., Offenbach-on-the-Maine, Germany. U.S. Pat. 767,070, Aug. 9, 1904.

DIAZOTISED aminonaphtholsulphonic acids (which have the amino- and hydroxy-groups in different benzene nuclei) are combined with *m*-hydroxydiphenylamine; the dyestuff

obtained from heteronuclear- β -amino- α -naphtholsulphonic acid is specified. These dyestuffs dye wool from acid baths orange to violet shades, converted, on subsequent chroming, to reddish-brown to brownish-violet.—T. F. B.

FRENCH PATENT.

Lakes from Sulphide Dyestuffs; Process for Making —. Act.-Ges. f. Anilinfabr. Fr. Pat. 341,346, March 14, 1904. XIII. A., page 873.

V.—PREPARING, BLEACHING, DYEING, PRINTING AND FINISHING TEXTILES, YARNS, AND FIBRES.

ENGLISH PATENT.

Dyeing Cotton and the like; Method of—, and Apparatus therefor. W. P. Thompson, Liverpool. From Wegmann and Co., Baden, Switzerland. Eng. Pat. 20,925, Sept. 29, 1903.

SEE Fr. Pat. 335,596 of 1903; this J., 1904, 251.—T. F. B.

UNITED STATES PATENTS.

Stearamide Mordant. A. Muller-Jacobs, Richmond Hill, N.Y. U.S. Pat. 767,114, Aug. 9, 1904.

STEARAMIDE, dissolved in an appropriate solvent, is used, in combination with aniline colours, as a mordant in colouring textile fibres or fabrics.—E. S.

Bleaching and Dyeing Apparatus. A. Holle, Düsseldorf, Germany. U.S. Pat. 767,563, Aug. 16, 1904.

SEE Eng. Pat. 18,756 of 1902; this J., 1903, 1043.—T. F. B.

Dyeing Apparatus. S. W. Cramer, Charlotte, N.C. U.S. Pat. 765,883, July 26, 1904.

A DYE-VESSEL, closed by a cover when in use, is provided with perforated, false top and bottom, means for securing the cover, an annular dye-liquor-supply pipe fixed below the false bottom, a liquor discharge pipe at the top and means for withdrawing the liquor, expressing this from the materials dyed, and removing the latter from the dye-vessel.—E. B.

Printing Machinery; Pattern —. C. L. Burdick, London. U.S. Pat. 767,684, Aug. 16, 1904.

SEE Fr. Pat. 328,714 of 1903; this J., 1903, 994.—T. F. B.

FRENCH PATENTS.

Collodion - Silk; Apparatus for Spinning —, with Recovery of the Solvents Used. M. Denis. Fr. Pat. 341,173, March 5, 1904.

ARTIFICIAL cellulose fibres are produced from collodion, whilst the alcohol and ether present in the latter are recovered, by causing the collodion to flow from a system of spinnerets into a pipe through which water or an aqueous denitrating solution, maintained at a temperature above the boiling point of ether, is passed. The vaporised ether ascends into a receiving pipe whence it is drawn off into a condenser. The water or aqueous solution is circulated until it is sufficiently saturated with alcohol, when it is replaced, the alcohol being recovered from it by distillation. The nitrocellulose or cellulose fibres are drawn through a trap in the pipe and are spun together in the usual manner.—E. B.

Dyeing in Several Colours on the Same Thread of Cotton; Process of —. Teinturerie Clément Marot. Second Addition, dated Feb. 25, 1904, to Fr. Pat. 337,027, Nov. 26, 1903. (See this J., 1904, 440 and 605.)

THE thread wound on the bobbin is only dyed in parts, this result being brought about by mordanting a portion of the thread, or by a partial discharge, or by allowing only a portion of the bobbin to come in contact with the dye bath, or by other similar means.—T. F. B.

Dyeing Tissues [Mechanical Reserves]; Process for —. L. Fanchamps-Philippe. Fr. Pat. 341,341, March 15, 1904.

TISSUES are placed between perforated plates upon which pieces, of appropriate shape and size, of an elastic material

are fixed. The plates are then immersed in a dye vat, or dye-liquor is drawn or forced through them, the tissues becoming dyed only in the less tightly compressed parts.—E. B.

Dyeing Fibres in the Loose State or in the Form of Slubbing, &c.; Apparatus for —. Hartmann & Co. Fr. Pat. 341,403, March 17, 1904.

THE object of this invention is to facilitate the removal of textile fibres from portable receptacles in which they have been bleached or dyed by the circulation of dye- or other liquors through them. The apparatus devised to this end consists of a receptacle composed of a perforated drum of slightly conical shape, forming the body of the receptacle, fitted to a detachable bottom open at its centre and extended upwards to form an inner tube, which is perforated for the admission of liquors from a circulating pump. The top of the inner tube is closed and is surmounted by a ring, by means of which the whole apparatus can be lowered and raised. After dyeing, the inner tube and bottom, along with the mass of fibres, are raised from the dye-vessel in which the operation has been effected, the outer vessel adhering to the fibres and being simultaneously removed. The receptacle is then placed upon a draining frame, upon which the outer cylinder is secured. The bottom and inner tube, with the fibres on or around them, are now raised and withdrawn from the outer vessel. The fibres being thus freely exposed to the air quickly become cool and are easily removed for further treatment.—E. B.

Dyeing and Printing Yarns and Printing Slubbing; Apparatus for —. G. Masarel-Leolercq. Fr. Pat. 341,281, March 15, 1904.

CHINE-PRINTED warp yarns are dried, either alone or together with dyed warp yarns, in a continuous manner in a vertical hot air chamber, provided with ventilators and radiators. Printing slubbing, alone or along with dyed slubbing, may be similarly treated.—E. B.

Printing [Fabrics]; Process of —. Soc. Anon. Prod. F. Bayer et Cie. Fr. Pat. 341,007, March 7, 1904.

ACETYL derivatives of cellulose, soluble in alcohol (see Fr. Pat. 317,007 of 1901, and Addition thereto; this J., 1902, 870; and 1903, 1015), may be substituted for the thickening agents usually employed in textile printing. White designs on a red ground are obtained by printing cotton, dyed, for instance, with "Geranin G," with a paste composed of zinc white, 40 grms.; glycerin, 20 grms.; acetone, 10 grms.; a 5 per cent. alcoholic solution of acetyl cellulose, 60 grms. The fabric is finally dried and steamed for 10 minutes.—T. F. B.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

Paper Dyeing. J. Nonnenmühlen. Färber-Zeit., 1904, 15, 229—230.

Mottled Papers may be manufactured by mixing in the cylinder short lengths of dyed jute or cellulose fibres with dyed and sized paper pulp.

Coloured Papers, which will not lose colour on immersion in water, are produced by "staining" with colour-lakes. These are obtained by precipitating (i) basic, (ii) acid, (iii) resorcinol (Eosine, &c.), and (iv) direct cotton dyestuffs, in the presence of kaolin, calcium sulphate, starch, or barium sulphate, with (i) tannic acid and basic aluminium sulphate, (ii) basic aluminium sulphate and barium chloride, (iii) lead acetate, and (iv) barium chloride, respectively. The precipitates are filtered off, dried, powdered, mixed with glue or gelatin solution, and applied to the paper, which is afterwards "satin" glazed.—E. B.

FRENCH PATENT.

Dyeing Skins for Gloves and other Purposes. P. Sorel. Fr. Pat. 341,450, March 19, 1904.

THE skins, after the usual preparation, are stained through to a uniform shade in a bath of a chromium compound.—R. L. J.

VII.—ACIDS, ALKALIS, AND SALTS.

Nitric and Sulphuric Acids; Properties of Mixtures of —. A. Saposchnikoff. J. russ. phys.-chem. Ges., 1904, 35, 1098—1112; 36, 518—532. Chem. Centr., 1904, 1, 1322—1323; 2, 396—397.

THE author examined mixtures of nitric acid with increasing amounts of sulphuric acid with regard to the partial pressure of the nitric acid; the composition of the vapour carried over by air at 25° C.; the vapour densities of the mixtures; and their specific conductivity. The acids used were sulphuric acid containing about 97 per cent. of the monohydrate, and the strongest nitric acid (containing, of course, oxides of nitrogen). The curves expressing the results obtained give no indication of the formation of compounds, such as the nitrosulphuric acid of Markownikoff, but point to the production of nitric anhydride to a small extent in presence of a large proportion of sulphuric acid. Experiments were also made with pure sulphuric acid monohydrate and nitric acid of sp. gr. 1.478 at 15° C., containing 0.4 per cent. of oxides of nitrogen. The vapour pressure of this nitric acid is only 16.64 mm., i.e., much lower than that of acid of sp. gr. 1.52. With increasing additions of sulphuric acid, the vapour pressure rises, attaining a maximum in a mixture containing about 35 per cent. of sulphuric acid. Further addition of sulphuric acid causes a gradual diminution of the vapour pressure, almost in accordance with Henry's law. Analysis of the vapours showed that from mixtures containing from 100 to 30 per cent. of nitric acid, they consisted of the pure monohydrate (nitric acid); from this point onwards, the nitrogen content of the vapours increased (up to 24 per cent. of nitrogen), apparently owing to a dehydration of the nitric acid, with formation of nitric anhydride. The results show distinctly that sulphuric acid dehydrates nitric acid containing water, and makes it thereby more active for the purpose of nitration.—A. S.

Ammonia-Soda Process from the Standpoint of the Phase Rule. P. P. Fedotieff. Z. physik. Chem., 1904, 49, 162—188.

THE reaction: $\text{NH}_4\text{HCO}_3 + \text{NaCl} = \text{NH}_4\text{Cl} + \text{NaHCO}_3$, upon which the ammonia-soda process is based, is reversible, and thus represents the phenomena of equilibrium of four substances, i.e., one of the most complicated cases of the phase rule. The author in attacking the problem makes use of the method proposed by Löwenherz (Z. physik. Chem., 1894, 13, 459), for representing graphically the experimental results. These results are set out in a series of tables and curve-diagrams. It should be possible, practically, to convert into sodium bicarbonate 75 per cent. of the sodium chloride taken, as against the theoretical 79—80 per cent. From the purely chemical standpoint the author considers that the later method of Schlösing, in which sodium chloride in the solid form or in solution, is treated directly with solid ammonium bicarbonate, is more rational than the so-called Solvay process, viz., carbonation of an ammoniacal solution of sodium chloride.—A. S.

Alkali Chlorates and Zinc Chloride; Simultaneous Preparation of —. by K. J. Bayer's Method. L. Friderich, E. Mallet and P. A. Guye. Chem.-Zeit., 1904, 28, 763—765.

THE authors have investigated Bayer's process (Eng. Pat. 17,978 of 1894; this J., 1895, 658), both in the laboratory and on a semi-manufacturing scale. The method consists in passing chlorine into a solution of alkali chloride containing zinc oxide in suspension, and subsequently heating the liquid obtained, the final result being expressed by the equation: $(1) 3\text{ZnO} + \text{NaCl} + 3\text{Cl}_2 = 3\text{ZnCl}_2 + \text{NaClO}_3$. The best yields are obtained by working with an excess of alkali chloride, and it is found that the following reactions occur, besides the one given above: $2\text{ZnO} + 4\text{Cl} = \text{Zn}(\text{OCl})_2 + \text{ZnCl}_2$; $\text{Zn}(\text{OCl})_2 + \text{H}_2\text{O} = \text{ZnO} + 2\text{HClO}$; $3\text{HClO} + \text{NaCl} = \text{NaClO}_3 + 3\text{HCl}$. The chlorination is best carried out at 40°—50° C., and a yield of 100 per cent. of dissolved alkali chlorate is obtained under normal conditions. If the chlorination be stopped before the last traces of the zinc

oxide are dissolved, any impurities (e.g., iron) present in the latter do not pass into the solution. For the separation of the alkali chlorate, the solution must be evaporated under reduced pressure at a relatively low temperature (e.g., that of the water-bath), as at higher temperatures, the reaction expressed by the equation (1) proceeds from right to left. The yield of chlorate is 96 per cent. of the total quantity in solution, and the crude product, if washed by the mother liquor from a previous crystallisation, yields, by one re-crystallisation, crystals containing only a trace of zinc. The mother liquor contains zinc chloride contaminated with alkali chlorate. The latter is converted into sodium chloride by treatment with hydrochloric acid, metallic zinc, or ferrous hydroxide or carbonate. The only impurity contained in the zinc chloride finally obtained is a small quantity of sodium chloride. The authors conclude that the process would give good results technically, one great advantage being that practically the whole of the chlorine is obtained in the form of valuable products, which is not the case with the ordinary chemical methods for the preparation of chlorates.—A. S.

Calcium Sulphate; Solubility of — in Aqueous Solutions of Sodium and Potassium Sulphates. F. K. Cameron and J. F. Breazeale. J. of Phys. Chem., 1904, 7, 335—340. Chem. Centr., 1904, 2, 501—502.

THE determinations were made at 25° C. The results are set out in curve-diagrams and tables. The following are some of the figures obtained:—

Potassium Sulphate.	Calcium Sulphate.	Sodium Sulphate.	Calcium Sulphate.
Grms. per Litre.	Grms. per Litre.	Grms. per Litre.	Grms. per Litre.
0.85	1.446	0.535	1.457
19.57	1.485	24.389	1.471
30.66	1.587	36.979	1.563
35.79	1.213	46.150	1.650
40.53	0.970	94.221	1.980
96.00	0.257	146.612	2.231

The potassium sulphate curve consists of two parts, of which the upper one represents the solubility of calcium sulphate in potassium sulphate solution, and the lower one the solubility of syngenite, $\text{CaSO}_4 \cdot \text{K}_2\text{SO}_4 \cdot \text{H}_2\text{O}$, in solutions containing more than 32 grms. of potassium sulphate per litre. The point of intersection is a triple point, corresponding to 32 grms. of potassium sulphate and 1.585 grms. of calcium sulphate per litre (32.47 grms. and 1.582 grms. respectively by direct determinations). The solid phases corresponding to this triple point are gypsum and syngenite. The sodium sulphate curve gives no indication of a stable double salt.—A. S.

Copper Oxide, Hydroxide, and Carbonate; Solubility of — in Ammonia Solutions. E. Murmann. Oesterr. Chem.-Zeit., 1904, 7, 272. Chem. Centr., 1904, 2, 410.

THE author finds that in the preparation of ammoniacal solutions of cupric hydroxide or carbonate, solution takes place immediately if a quantity of commercial ammonium carbonate or some other ammonium salt equal to half the weight of the copper compound be added. Ignited pure copper oxide, which is very slightly soluble in ammonia, is considerably more soluble in presence of ammonium salts.—A. S.

Borax; An Abnormal —. L. Spiegel. Chem.-Zeit., 1904, 28, 750—751.

A SAMPLE of refined borax was melted until its water of crystallisation was expelled. It was then dissolved in water, and titrated with sulphuric acid. The titration indicated the presence of the hitherto unknown sodium triborate, $\text{Na}_2\text{O} \cdot 3\text{B}_2\text{O}_3$. When the triborate is crystallised from water, ordinary sodium baborate separates out first, and from the mother-liquor crystals of tetraborate can be obtained. The new compound is not easily prepared from sodium hydroxide and boric acid in aqueous solution, but experiments showed that it could be formed in, and crystallised from, a solution

containing baborate and an excess of boric acid. Its occurrence in commercial borax appears to be extremely rare.

—E. H. T.

Tungstates of Sodium; Action of Zinc on —. L. A. Hallopeau. *Comptes rend.*, 1904, 139, 283–284.

ZINC has no appreciable action on normal sodium tungstate ($\text{Na}_2\text{O} \cdot \text{WO}_3 \cdot 2\text{H}_2\text{O}$) at the boiling point of zinc. With the paratungstate ($5\text{Na}_2\text{O} \cdot 12\text{WO}_3 \cdot 28\text{H}_2\text{O}$) crystals of normal zinc tungstate, ZnWO_4 , form the chief product; but golden-yellow scales, probably Wöhler's tungsto-sodium tungstate, $\text{Na}_2\text{WO}_4 + \text{WO}_3 \cdot \text{WO}_3$, are also obtained in small quantity and a little tungsten as a grey powder. The reaction therefore differs from that of tin on sodium paratungstate, and from that of zinc on ammonium tungstate or on tungstic anhydride (this J., 1900, 829 and 908).

—F. Sdn.

Manganese Solution; Self-purification of — from Contained Iron. G. Kassner. *Arch. Pharm.*, 1904, 242, 407–409.

A MANGANOUS sulphate solution containing iron equivalent to 0.0162 per cent. of its manganous sulphate content, deposited, when left to itself, a blackish-brown sediment. It was found that this sediment contained the whole of the iron present, the supernatant solution being absolutely free from iron. The author supposes that the catalytic action of the manganese salt hastens the atmospheric oxidation of the ferrous salt, and that a basic ferric salt is deposited. To take advantage of this reaction for the purification of manganous salts from iron, the iron present must be reduced to the ferrous condition, and the solution must be carefully neutralised.—J. T. D.

Nitric Oxide and Oxygen; Reaction between — at Low Temperatures. L. Francesconi and N. Sciacca. *Gaz. chim. ital.*, 1904, 34, 447–457. *Chem. Centr.*, 1904, 2, 397.

THE authors' results were briefly as follows:—Nitric oxide and oxygen both in the liquid condition, or nitric oxide in the liquid or solid condition, and oxygen as gas, or nitric oxide as gas and oxygen in the liquid state, always yielded, in whatever proportions they were mixed, nitrous anhydride. Nitric oxide and oxygen (in excess), both in the gaseous condition, gave nitrous anhydride at temperatures below -110°C . Nitrous anhydride was converted by oxygen into nitrogen peroxide only at temperatures above -100°C . Reduction of nitrogen peroxide to nitrous anhydride by nitric oxide began at -150°C . Nitrous anhydride under normal pressure was stable up to a temperature of -21°C .—A. S.

Electrolysis of Alkali Chlorides. Theory of Diaphragm Electrolysis. P. A. Guye. *XI. A.*, page 869.

Electrolysis of Alkali Chlorides; Physico-Chemical Studies on the —. A. Tardy and P. A. Guye. *XI. A.*, page 869.

Persulphates; Quantitative Determination of —. E. Pannain. *XXIII.*, page 882.

Sulphur; Commercial Valuation of —. J. Ceruti. *XXIII.*, page 883.

ENGLISH PATENT.

Oxygen; Apparatus for the Commercial Manufacture of —. B. Artigue, Paris. *Eng. Pat.* 14,848, July 1, 1904. Under Internat. Conv., July 6, 1903.

SEE *Fr. Pat.* 333,603 of 1903; this J., 1903, 1348.—T. F. B.

UNITED STATES PATENT.

Denitrating Plant [for Sulphuric Acid]. R. Evers, Förde, Germany. *U.S. Pat.* 767,335, Aug. 9, 1904.

SEE *Fr. Pat.* 323,397 of 1902; this J., 1903, 495.—T. F. B.

FRENCH PATENTS.

Bichromates and Chlorates; [Electrolytic] Process of Manufacturing —. A. E. Gibbs. *Fr. Pat.* 341,223, March 12, 1904.

A SOLUTION of a chromate is treated with chlorine, either by passing the gas into a concentrated solution or by electrolysis of a solution of alkali chromate and alkali chloride; the products are separated from one another and from unchanged chloride by fractional crystallisation. If a larger proportion of chromate be required, alkali can be added to the solution from time to time, to reconvert some of the bichromate into chromate.—T. F. B.

Filling Materials; Manufacture of —, for various Applications. Soc. Solvay et Cie. *Fr. Pat.* 341,355, Feb. 8, 1904.

VARIOUS substances, inert chemically, but used in the arts for filling purposes and the like, are prepared, such as calcium carbonate or sulphate, barium sulphate, kaolin, &c., and in illustration, the following processes, all starting with lime obtained by calcining limestone, &c., are given:—(a) A solution of lime in a saccharine liquid is treated with carbon dioxide to obtain precipitated calcium carbonate. (b) Milk of lime is passed through a sieve, the cleared portion is precipitated by carbon dioxide, and the residue may be utilised to obtain an inferior product. (c) Sodium carbonate is treated with milk of lime, the calcium carbonate formed is filtered off, and the caustic solution is carbonated for re-use. (d) Ammonium chloride is treated with lime, whereby calcium chloride is formed, with liberation of ammonia. (e) The calcium chloride thus formed may be treated (in solution) with ammonia and carbon dioxide, to precipitate calcium carbonate, and reproduce ammonium chloride. (f) Or, calcium chloride solution is treated with a liquid containing sodium carbonate or bicarbonate such as that produced in the ammonia-soda process, whereby calcium carbonate is precipitated, and sodium chloride remains. Some of the calcium compounds indicated may be replaced by corresponding magnesium compounds.—E. S.

Ammonia and Cyanogen Compounds; Obtaining Simultaneously — by Treatment of [Coal] Gas. W. Feld. *Fr. Pat.* 341,614, Jan. 18, 1904. *II.*, page 861.

VIII.—GLASS, POTTERY, ENAMELS.

UNITED STATES PATENT.

Glass; Process of Manufacturing —. S. O. Richardson, jun., Toledo, Ohio. *U.S. Pat.* 766,771, Aug. 2, 1904.

THE process is continuous and consists in supplying a batch and reducing it in a substantially closed chamber, heated externally. The resulting product is conducted into a "plaining" chamber during the reducing process, and the resultant "metal" flows continuously into a directly-heated receiving chamber, which is at a lower temperature than the "plaining" chamber. In this receiving chamber the "metal" undergoes a prolonged "plaining" process, and flows continuously from the lower portion of this tank or chamber into a working tank, from which it is worked. See *U.S. Pat.* 756,409, April 5, 1904; this J., 1904, 489.

—W. C. H.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

ENGLISH PATENTS.

Kilns; Continuous — for Burning Blue and Salt-Glazed and Vitrified Bricks, Tiles, Pipes, and Terra Cotta and like Goods. F. Fidler, Wigau. *Eng. Pat.* 12,201, May 30, 1904.

INSIDE flues are constructed down the sides and along the front firing face of the kilns, to carry the heat from burning and cooling chambers through those in which "blueing," &c. is in progress to chambers ahead without

affecting the proceedings named.. The flues are provided with perforated covered tops to serve as "fire-benches," the passage of gases through the flues and holes being controlled by fireclay slabs over the holes.—W. C. H.

Kiln; Improved Vertical —, to which the Heat is Supplied by the Aid of Furnaces or Combustion Chambers and by Aid of a Blast. C. R. Gostling, Mitcheldean, Gloucester. Eng. Pat. 14,075, June 22, 1904.

THE heat from the furnaces, which are exterior, but adjacent to the vertical kiln, and which may be fed with solid, liquid or gaseous fuel, is forced into the kiln by means of a fan or other blast. The material to be calcined is fed in at the top and continuously withdrawn, when burnt, from a suitable cooling chamber below the kiln.

—W. H. C.

Kilns for Burning Fireproofing Tile and other Clay Products; Continuous —. D. F. Henry, jun., Port Murry, N.J., U.S.A. Eng. Pat. 14,374, June 25, 1904.

SEE Fr. Pat. 338,561 of 1903; this J., 1904, 663.—T. F. B.

Kilns for Burning Cement, Lime, and the like. N. Perignani, Tehoudowo, Russia, and E. Candlot, Paris. Eng. Pat. 22,769, Oct. 21, 1903.

SEE Fr. Pat. 335,377 of 1903; this J., 1904, 188.—W. C. H.

Agglutinant or Cement, and Method of Manufacturing the same. F. J. M. M. Ducastel, Paris. Eng. Pat. 9944, April 30, 1904.

DRIED and powdered lime or cement is mixed with a certain quantity of silica, silicates, or carbonates, also in powder, in a furnace consisting of a rotary horizontal iron cylinder, lined with flint masonry, in which mixture is effected by the action of rounded flint rollers, whilst heating gases are passed through, derived from the combustion of gas, from an independent generator, in a chamber connected to the rotary furnace. The gas thus introduced, containing much carbon dioxide, is stated to produce reactions in the materials treated, inducing formation of "either acid silicates or bicarbonates." The heated gases pass from the furnace to apparatus for drying the materials used.—E. S.

UNITED STATES PATENTS.

Fireproofing Wood; Process of —. J. L. Ferrell, Philadelphia. U.S. Pat. 767,514, Aug. 16, 1904.

SEE Fr. Pat. 319,123 of 1902; this J., 1902, 1455.—T. F. B.

Cement or Cementitious Products; Machine for Making —. W. E. Jaques, Assignor to A. O. Crozier, Grand Rapids, Mich. U.S. Pat. 766,260, Aug. 2, 1904.

THE apparatus consists of a horizontal chamber to which material is supplied through a tapered mouth. One end of the chamber develops into a comparatively long narrowing die. Longitudinally through the chamber is arranged a screw which extends into the die. The pitch of the threads of this screw is greater in the narrow portion of the die than in the chamber, so that material is carried through more rapidly than it is fed in.—W. C. H.

FRENCH PATENT.

Furnace for Burning a Raw Mixture of Cement, and for other Purposes. G. Gröndal. Fr. Pat. 341,382, March 16, 1904.

THE apparatus consists of a hollow rotary drum, slightly inclined, at the upper and lower ends of which are vertical furnaces; an orifice for the gas to enter the drum, and one for charging the material to be burned in the upper furnace. The lower vertical furnace is constructed so that the gas and air can pass through horizontal channels in it to the burner, the gas thus becoming heated by contact with the burnt material passing down the furnace. The upper furnace is similarly constructed, so that the products of combustion and any material in the form of powder are carried off to the chimney and cooled by imparting sensible heat to, and thus pre-heating, raw material fed in.

—W. C. H.

X.—METALLURGY.

Steel; Strength of — at High Temperatures. C. Bach. Z. Ver. deutsch. Ing., 1903, 762. Proc. Inst. Civil Eng., 1904, 156, 56—57.

SPECIMENS of steel were tested at the ordinary temperature and at 200°, 300°, 400°, 500°, and 550° C. The tensile strength increased up to 300° C., and then decreased. For example, the tensile strength of one specimen was 4267 kilos. per sq. cm. (27 tons per sq. in.) at the ordinary temperature; about 4767 kilos. per sq. cm. (30·17 tons per sq. in.) at 300° C.; and 2070 kilos. per sq. cm. (13·1 tons per sq. in.) at 550° C. The ultimate extension decreased from 25·5 per cent. at ordinary temperatures to 7·7 per cent. at 200° C., from which point it rose again to 39·5 per cent. at 550° C. The contraction of area was also less at 200° C. than at ordinary temperatures, but did not commence to rise again until the temperature was above 300° C. Increased duration of the action of the load during the tests had no effect on the tensile strength at ordinary temperatures, but caused a slight decrease at 300° C., and a still greater decrease at 400° and 500° C. By prolonging the action of the load, extension and contraction of area were increased between 300° and 400° C., but then again decreased until, at 500° C., they were lower by 20—25 per cent. than with the ordinary duration of test. The results show that steel for steam boilers, piping, &c. should be tested at higher as well as at ordinary temperatures.

—A. S.

Chromium Steels; Properties and Constitution of —. L. Guillet. Comptes rend., 1904, 139, 426—428.

THE results of the micrographic study of two series of chromium steels, with 0·200 and 0·800 of carbon respectively, are summarised in the following table:—

Class.	Microstructure.	Chromium-content in Steels containing:	
		0·2 per Cent. of Carbon.	0·8 per Cent. of Carbon.
		Per Cent.	Per Cent.
1	Pearlite.....	0—7	0—5
2	Martensite or troostite.....	7—15	5—10
3	Martensite and carbide.....	15—20	10—18
4	Carbide.....	Above 20	Above 18

The term "carbide" is applied to a special constituent, appearing as white globules after attack by picric acid, which the author has not yet isolated. The table shows that the higher the carbon-content, the less the proportion of chromium needed to pass from one structure to another. Mechanically, the same classes are distinguishable, save that classes 2 and 3 tend to run into one another. In the pearlitic steels, with constant carbon, increase of chromium raises the breaking stress, the elastic limit, and the hardness; the elongation, the diminution of cross section, and the brittleness are not greater than in ordinary steels with the same carbon-content. The martensite and troostite steels have an exceedingly high breaking stress, elastic limit, and hardness; very low elongation and contraction of area; medium resistance to shock. The "carbide" steels have medium breaking stress, elastic limit, and hardness; high elongation; considerable contraction of area; but are very brittle. Re-heating softens all these chromium steels. Tempering modifies the pearlitic steels as it does ordinary steels, but acts with greater intensity; it slightly softens the martensite steels, producing some γ -iron; whilst with the "carbide" steels it produces no effect, mechanical or micrographic, between 850° and 1150° C.; but at 1200° C. sharply defined white regions are produced, apparently of γ -iron, and the carbide disappears more or less completely, according to the speed of cooling and the content of chromium. Only the pearlitic chrome steels possess industrial interest.—J. T. D.

Vanadium Steels. L. Guillet. *Comptes rend.*, 1904, 139, 407—408.

CONTINUING his researches (this J., 1904, 255), the author finds that the pearlitic vanadium steels are very sensitive to thermal and mechanical treatment, and that when reheated to 900° C. and slowly cooled, they are not more brittle than ordinary steels with the same carbon-content. High vanadium steels, the carbon of which is entirely as carbide, are completely heterogeneous, probably because the vanadium carbide existing in the melted metal tends to rise to the surface. The only vanadium steels of industrial interest are those containing less than 0.7 per cent. of vanadium. A table of the results of mechanical tests is given in the paper.—J. T. D.

Zinc and Magnesium; Alloys of — O. Boudonard. *Comptes rend.*, 1904, 139, 424—426.

THE curve of melting-points of these alloys shows a maximum (570° C.) at a point corresponding with the alloy Zn_2Mg , 84 per cent. of zinc; and two minima (355° and 332° C.). The alloys are all more or less brilliantly white in colour. That with 10 per cent. of zinc can be filed or sawn, but as the proportion of zinc increases, the alloys become more and more brittle; their fracture is conchoidal, or in some cases very finely granular. Micrographically, the 90 per cent. zinc alloy shows alternate white and black regions, the black portions being themselves heterogeneous and exhibiting a sort of perlitic structure; the 50 per cent. zinc alloy shows fine arborescent crystals ($ZnMg_2$). Two definite compounds have been isolated from these alloys— Zn_2Mg from the 80 per cent. zinc alloy by treatment with 0.3 per cent. hydrochloric acid, and $ZnMg_2$ from the 30 per cent. zinc alloy by treatment with 5 per cent. ammonium chloride solution.—J. T. D.

Copper; Physical Properties of — [Crusher Gauges for Recording Powder Pressures]. P. Galy-Aché. *Ann. Chim. Phys.*, 1903, 326. *Proc. Inst. Civil Eng.*, 1904, 156, 59.

THE experiments were made with a view of interpreting the deformations of copper crusher gauges which are used for recording powder pressures. It was found that the "breakdown point" for compression is always raised to the level of the stress applied previously, which can therefore readily be ascertained by testing a used crusher gauge and noting its breakdown point. The amount of compression was greater under the drop test than in the testing machine, owing to the lowering of the breakdown point due to the raising of the temperature by a blow. The breakdown point decreased from 10 tons per sq. in. at - 58° F. (- 50° C.) to 8.5 tons at 392° F. (200° C.). It was also considerably effected by annealing, being, for example, 9.3 tons per sq. in. for an unannealed specimen, but only "0.64 ton" for a sample annealed at 1832° F. (1000° C.). For equal elongations, the acquired breakdown point in tensile test pieces was greater with rapid (drop) testing than with slow testing. As the temperature of annealing was increased, the crystalline structure of the copper became coarser.

—A. S.

"Crystallitic" Forms; Permanence of — in Crystals [Metals]. F. Osmond and G. Cartaud. *Comptes rend.*, 1904, 139, 404—406.

CHARPY and others have noticed in the structure of the surfaces of bronze, cut, etched, and polished, crystallitic forms the axes of which have a constant direction in the same crystalline granule. These have usually been attributed to lack of homogeneity in the metal, the proportion of copper diminishing with the distance from the crystallitic axes, the points of first solidification. The authors find, however, that these appearances are largely due to mechanical causes—chiefly the different degrees of hardness of the eutectic and the crystalline granules and the varying extents to which the surface is removed by the etching and polishing operations; and it is possible to eliminate or considerably diminish them by lessening the thickness of material removed during these operations. This is best effected, with soft metals like copper (or even lead), by

alternating several etching and polishing operations, using materials which shall act as gently as possible. The etching solutions for copper and its alloys should be picric acid and quinone in alcohol or acetone, or aqueous ferric chloride solution slightly acidified; and the polishing should be done by hand with a cloth dusted over with chromic oxide and wetted with weak ammonia.—J. T. D.

Metals; Evolution of Structure in — G. Cartaud. *Comptes rend.*, 1904, 139, 428—430.

THE author finds that the cellular structure described by him as existing on the cooled surface of metals poured out in the melted state in a thin layer over a polished surface (this J., 1901, 811), also exists in the interior of an ingot. The progress of micrographic art has rendered it possible to polish and etch the surfaces of sections of soft metals like zinc, tin, or lead; and microscopic examination of these surfaces shows the existence of a cellular structure the boundary lines of which are followed and cut by the boundary lines of the larger crystalline structure much as the delineation of the course of a river on a map would be followed and cut by a line indicating its average direction. He suggests that the cellular structure forms a stage—a temporary state of equilibrium—in the evolution of the final stable crystalline state. Traces of this earlier stage still exist in the final state, but when the final state has been, so to speak, confirmed by treatment, such as deformation and subsequent reheating, the crystalline boundary lines alone remain, and no sign of the cellular structure is left.—J. T. D.

ENGLISH PATENTS.

Furnaces for Baking Briquettes made of Ore, Concentrate, or other Material. W. Simpkin, London. Eng. Pat. 21,188, Oct. 2, 1903.

THE furnace is of the tunnel type, with a central combustion chamber and rails entirely occupied by linked cars loaded with the briquettes to be baked, both ends of the furnace being closed ordinarily by sliding doors. The walls are built with expansion pockets. A sand lute extends on both sides of the rails, into which sand an apron, carried by each car, projects, to prevent the passage of heating gases from the upper to the under side of the car. Air admitted by vertical ducts near the entrance end of the furnace, passes beneath the cars, and at the opposite (exit) end rises through other ducts to the upper part of the furnace, meeting a supply of air under forced draught, and passes over the tops of the cars, cooling them preparatory for discharge, whilst the air on reaching the combustion chamber becomes heated, and heats the cars near to the entrance end, near to which is the escape for the gases of combustion to the stack. The combustion chamber is supplied with finely-powdered coal, or with gaseous fuel under pressure. For each car drawn out, another loaded car is admitted at the entrance end.—E. S.

Cupola. T. Holland, Delphos, Ohio. Eng. Pat. 7694, March 31, 1904. Under Internat. Conv., April 3, 1903.

THE object of the invention is to introduce into a cupola for melting metals, &c., hot-air blasts in such a manner as to raise quickly and maintain uniformly a very high temperature. For this purpose, an air receiver, having air-baffling partitions extending transversely one above another, and opening alternately at opposite ends, is arranged in the upper portion of the cupola, with a cold-air pipe leading into the receiver, around which latter a portion of the pipe is coiled. Pipes leading from the receiver and from an air-jacket convey the highly-heated air to the lower portions of the cupola.—E. S.

Ferruginous Ore; Process of and Apparatus for Treating — for the Manufacture of Iron and Steel therefrom. M. Moore, Melbourne, and T. J. Heskett, Brunswick, Victoria. Eng. Pat. 4975, Feb. 29, 1904.

SEE Fr. Pat. 341,169 of 1904; this J., 1904, 837.—T. F. B.

UNITED STATES PATENTS.

Separation [of Metalliferous Ore from Gangue]; Process of —. A. Schwarz, Assignor to C. N. Lindley, New York. U.S. Pat. 766,289, Aug. 2, 1904.

THE materials to be separated, such as the metalliferous portions of ore from the gangue, are moistened, in the granular or pulverulent state, with water, and are then introduced, without agitation, into a bath containing two liquids of different specific gravity, insoluble in each other, such as oil floating on water or on a solution of salt in water.—E. S.

Ores; Recovering Values [Copper, &c.] from — by Dissolving in Molten Baths. B. Baggaey, Pittsburgh, Pa., and C. M. Allen, Lolo, Mont. U.S. Pat. 766,654, Aug. 2, 1904.

A BATH of low-grade copper matte is formed in a converter through which air is blown, and successive additions are made, first, of ore containing a high proportion of silicious matter, in order to flux the iron present, and lastly, of other molten matte, to replenish the bath as its volume is decreased by enrichment. Compare U.S. Pat. 746,260 of 1903, this J., 1904, 23.—E. S.

[Copper] Ore; Method of Smelting —, and Cleaning Converter Slag. R. Baggaey, Pittsburgh, Pa., and C. M. Allen, Lolo, Mont. U.S. Pat. 766,655, Aug. 2, 1904.

SLAG from a Bessemer converter is poured upon the charge of "sulphide ore" which is being smelted in a copper-ore smelting furnace, contributing heat thereto, and facilitating the smelting process. Or, the smelted product of "sulphide ore" is charged directly into a converter, into which silicious ore is also charged, and the slag is withdrawn from time to time, while molten, and poured upon the ore whilst it is being smelted. See also the preceding abstract.—E. S.

Matte [Copper]; Method of Producing —. R. Baggaey, Pittsburgh, Pa., and C. M. Allen, Lolo, Mont. U.S. Pat. 766,656, Aug. 2, 1904.

AIR is blown into a molten bath of copper matte, to which is added successive small quantities of a highly silicious metal-bearing ore, whereby the iron present is fluxed. The bath is then replenished with molten ore, and with "molten material high in fuel value." See also the two preceding abstracts.—E. S.

Magnetic Materials [Alloys]; Method of Making —. R. A. Hadfield, Sheffield, England. U.S. Pat. 767,110, Aug. 9, 1904.

To produce a magnetic material of high permeability and low hysteresis, a magnetic substance is alloyed with silicon, and the alloy, reduced to a "thin body," is heated to a temperature below its melting point, then quickly cooled, reheated to a temperature higher than that first employed, and allowed to cool slowly. Compare U.S. Pat. 745,829 and Eng. Pat. 4981, both of 1903; this J., 1904, 23 and 190.—E. S.

Furnace for Burning Materials [Treating Ores, &c.] C. W. Stanton, Mobile, Ala. U.S. Pat. 767,180, Aug. 9, 1904.

SEE Eng. Pat. 4806 of 1903; this J., 1903, 1090.—T. F. B.

Furnace; Regenerative Gas Reheating —. F. Siemens, Dresden. U.S. Pat. 767,840, Aug. 16, 1904.

SEE Eng. Pat. 25,057 of 1902; this J., 1903, 1197.—T. F. B.

Lead; Process of Manufacturing Spongy —. J. H. Mercadier, Louvres, France. U.S. Pat. 767,906, Aug. 16, 1904.

SEE Fr. Pat. 331,006 of 1903; this J., 1903, 1092.—T. F. B.

FRENCH PATENT.

Steel and Armour Plates; Process for Treating —. E. W. Engels. Fr. Pat. 341,503, March 21, 1904.

SEE Eng. Pat. 1842 of 1904; this J., 1904, 374.—T. F. B.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(A.)—ELECTRO-CHEMISTRY.

Diaphragm for Electrolytic Cells; New Form of —. F. M. Perkin. Electro-Chemist and Met., 1904, 4, 2—4.

THE diaphragm is constructed of two concentric perforated cells, the space between them being filled with some material which forms the diaphragm proper. This may be asbestos, parchment, or filter paper, or may be made *in situ* from a pulp of asbestos, or from powdered glass or sand, which is poured into the annular space between the cells. The perforations in the cells are about the diameter of an ordinary pin.—R. S. H.

Alkali Chlorides; Electrolysis of —. Theory of Diaphragm Electrolysis. P. A. Guye. Arch. Sc. phys. nat., Genève, 1903, 15, 612—622; 16, 393—416, 652—668. Science Abstracts, 1904, 7, A, 198—199.

IT is shown that the apparently complex character of the electrolysis of alkali chlorides under the ordinary conditions of working becomes very much simplified by accepting the fundamental principle of Hittorf, viz., that the alkali chloride and alkali participate simultaneously in the electrolysis. At any particular temperature, the instantaneous current yield, r , is practically only a function of the alkali concentration, c , and may be expressed very approximately by the equation: $r = 1 - \pi x$, where π is the "transport number" of the hydroxyl ions, and x the amount of alkali taking part in the electrolysis. If the concentration of the alkali chloride in the cathode liquid be kept constant, the relation is: $r = 1/(1 + ac)^{1/2}$; whilst if the chloride in the cathode liquid is not replaced as it is gradually decomposed, the relation becomes: $r = 1/(1 + ac)$. In either case the value of a is influenced but slightly by variations in the concentration or temperature of the electrolyte. Two methods of working are in vogue in diaphragm electrolysis, viz.: (1) The electrolysis is continued until the alkalinity of the cathode solution reaches a certain value, when the liquid is replaced by fresh solution. (2) The concentration of the cathode solution is kept approximately constant by continuous feeding with chloride solution. The first of these methods is the more economical with regard to the consumption of electrical energy. When the second method of procedure is followed, two cases may arise: (a) When the added solution does not mix with the remainder; this is approximately so in practice when the cathode compartment is large and the current density small, and in such a case the yield is the same as with the first method of working. (b) When instantaneous and complete mixture takes place; this condition is closely realised when the cathode compartment is small, and the current density high. Experimental results obtained in tests on a large scale agreed well with those calculated by the author.—A. S.

Electrolysis of Alkali Chlorides; Physico-Chemical Studies on the —. A. Tardy and P. A. Guye. J. de Chim. Phys., 1904, 2, 79—123. Chem. Centr. 1904, 2, 292—293.

Mode of Action of Diaphragms.—In a diaphragm apparatus for the electrolysis of alkali chlorides the following processes take place:—(1) Physical diffusion of the alkali from the cathode liquid into the anode compartment. (2) Migration of hydroxyl ions into the anode compartment. (3) Depression of the level of the anode liquid in consequence of electrical osmose towards the cathode compartment. (4) Diffusion of cathode liquid to the anode compartment induced by (3). It has been shown that the migration of ions mentioned under (2) is the chief cause of the transference of alkali to the anode compartment. The counteracting influences (3) and (4) produce after some

time a condition of equilibrium, the depression of the level of the anode liquid finally established being proportional to the strength of the current and the thickness of the diaphragm, and inversely proportional to the superficial area of the diaphragm. The equation given previously (see preceding abstract) for the instantaneous current-yield must be modified by the introduction of two subtractive terms, and should read: $r = f(c) - k_1c - k_2c$. The coefficient k , depends upon the diffusion and electrical osmose, and k_2 upon the permeability of the diaphragm. In an examination of the efficacy of a diaphragm, diffusion, electrical endosmose and the "overflowing" of the anode liquid have alone to be considered. The authors examined a number of different diaphragms and found that it is possible to fix certain characteristic constants for each one, which are of value in judging its efficiency. (1) Ratio, r_1 , of the hollow spaces of the diaphragm to its apparent volume. (2) Absolute coefficient of permeability k . This is determined by ascertaining the amount of water which is forced through 1 sq. decm. of the diaphragm at a definite temperature in 1 hour by a pressure of 1 cm. of water, and referring the result to a liquid having a viscosity of 1. The viscosity of water at different temperatures was found to be as follows:—0° C., 0.01778; 5°, 0.015095; 10°, 0.013025; 15°, 0.011335; 20°, 0.010015; 25°, 0.00891; and 30° C., 0.007974. The coefficient of permeability k is also proportional to the loss of salt by electrical endosmose. (3) Specific coefficient of electrical resistance $= e/r_1$ (e = thickness of the diaphragm). (4) Coefficient of loss by diffusion. The actual diffusion is always less than the calculated, owing to the peculiar nature of the capillary channels forming the diaphragm. For the last constant (5) the virtual thickness of the diaphragm calculated from the diffusion is substituted for the actual thickness. The following conclusions are drawn with regard to the technical electrolysis of alkali chloride solutions with the aid of diaphragms:—The level of the anode liquid should always be kept as high as that of the cathode liquid. The current-density should be tolerably high in order that the endosmotic flow from anode to cathode may in some measure compensate diffusion in the opposite direction; the permeability of the diaphragm may also be somewhat diminished. Under these favourable conditions the yield attains the normal value fixed in the earlier investigation (see preceding abstract).—A. S.

Magnetite Arc-Lamp. C. P. Steinmetz. II., page 859.

ENGLISH PATENTS.

Sterilising Water by Means of Ozone; Apparatus for — R. F. Wood-Smith. Eng. Pat. 18,193, Aug. 22, 1903. XVIII. B., page 879.

Gaseous Germicide and Insecticide; [Electrical] Process and Apparatus for producing a — R. Marot. Eng. Pat. 14,372, June 25, 1904. XVIII. C., page 879.

UNITED STATES PATENTS.

Battery; Primary — T. A. Edison, Llewellyn Park, N.J., Assignor to Edison Manufacturing Co., Orange, N.J. U.S. Pat. 766,815, Aug. 9, 1904.

THIS invention consists of a negative electrode for primary batteries, comprising a porous compressed mass of black oxide of copper in an extremely finely-divided condition, and carrying a film of finely-divided red oxide of copper applied to the porous surface.—B. N.

Accumulator. J. A. Lyons and E. C. Broadwell, Chicago. U.S. Pat. 766,958, Aug. 9, 1904.

THE accumulator consists of a retaining-cell of metal, lined with a porous non-conducting material such as "a fabric," and an anode element, comprising an inert conducting core of carbon surrounded by a mixture of finely-divided carbon, and an oxide or hydroxide of a metal capable of more than one degree of oxidation. The electrolyte, always neutral or weakly basic, consists of a solution of a basic haloid, or oxy-salt of a metal, which, by electrolysis, deposits in a reguline condition at the cathode.—B. N.

Storage-Battery Gases; Method of Rendering — Non-explosive. T. A. Edison, Llewellyn Park, N.J., Assignor to Edison Storage Battery Co., Orange, N.J. U.S. Pat. 767,554, Aug. 16, 1904.

THE gases, generated within the electrolyte of a storage battery, are passed through a contracted vent, then spread, diffused, and attenuated, and finally passed through a cooling medium, such as wire gauze.—B. N.

Electrolytic Apparatus. W. J. Schweitzer, Whiteplains, N.Y. U.S. Pat. 767,964, Aug. 16, 1904.

THE teeth of the positive and negative comb-like electrodes are formed like truncated pyramids in lateral cross-section, the electrodes being arranged alternately in series and with the narrower faces of the teeth in the direction from which the electrolyte flows. The teeth of the alternating combs in the series are relatively "staggered," so as to afford tortuous passages for the electrolyte without retarding the flow.—B. N.

FRENCH PATENTS.

Bichromates and Chlorates [Electrolytic]; Process of Manufacturing — A. G. Gibbs. Fr. Pat. 341,323, March 12, 1904. VII., page 866.

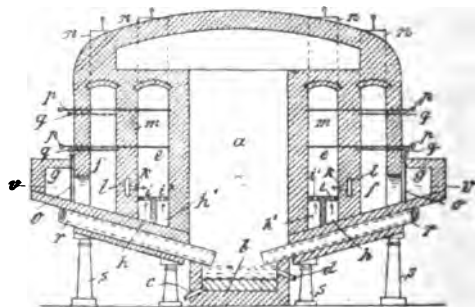
Wines and Spirits; Improvement [Electrical] of — and *Sterilisation Liquids.* V. Dorn. Fr. Pat. 341,671, March 26, 1904. XVII., page 878.

(B.)—ELECTRO-METALLURGY.

ENGLISH PATENTS.

Electric Furnaces; Method of and Apparatus for Heating the Charge of — A. Neuburger, Berlin, and A. Minet, Paris. Eng. Pat. 9468, April 25, 1904.

THE shaft, a , and crucible hearth, b , are enclosed in an annular series of main preliminary heating chambers, e , which in turn are surrounded by an annular series of preliminary heating chambers, f . By means of the vertically adjustable slides, n , the chamber, e , may be divided into separate chambers of any number and size, any particular chamber being switched out by opening the slides, o , on each side of the chamber, so that circulation then takes place in the outer channel, g . Slides, p and q , similarly divide e and f into horizontal zones of heat.



The chambers, e and f , communicate with each other by channels, h , and openings, i . The interchangeable electrodes, r , are hollow, in order to allow of direct admission of gas to the hearth, b . Hot combustible gases are passed through one or both chambers, e and f , but if combustion of the gases is required in e , air is heated by passing it through the passage, l , and openings, k , in the wall, m , the outer series, f , being then used for the discharge of the combustion gases for the purpose of utilising their heat.

—B. N.

Scale from Iron and Similar Metals; Removal of — C. C. Garrard, and Messrs. Ferranti, Ltd., Hollinwood, Lancashire. Eng. Pat. 21,299, Oct. 3, 1903.

THE iron or steel article is constituted the cathode in an electrolytic cell, charged, for instance, with dilute sulphuric acid, an indifferent insoluble substance, such as

carbon, being used as the anode. A current of sufficient voltage (say 8 volts) to render the metal electronegative to the solution is used, whereby the dissolving action of the acid is counteracted. The scale is stated to be thus removed, leaving the iron or steel clean.—E. S.

UNITED STATES PATENT.

Metals; Apparatus for Vacuously Depositing — T. A. Edison, Llewellyn Park, N.J., Assignor to New Jersey Patent Co., Orange, N.J. U.S. Pat. 767,216, Aug. 9, 1904.

In an exhausted chamber are arranged a pair of metallic foil electrodes, which are supported at the upper ends and weighted at the lower ends, and between the electrodes is a vertical shaft carrying a sleeve capable of rotation, a disc on the sleeve supporting the objects to be coated. The sleeve also carries a removable armature, which is attracted and rotated by a magnet mounted outside the chamber. A pair of chambers may be used, with means for connecting a source of high tension current alternately and automatically with the electrodes of the respective chambers; or a number of supports for the objects and a corresponding number of pairs of electrodes in a single vacuum chamber may be used, with means for alternately and regularly connecting the source of the current with the electrodes in pairs.—B. N.

FRENCH PATENTS.

Cast Iron; Process and Apparatus for the Electrical Production of —, chiefly for the Manufacture of Steel. Soc. Electro-Métallurgique Française. Fr. Pat. 341,611, March 25, 1904.

THE lower part of the furnace consists of a water-jacketed graphite crucible, lined at the bottom with an iron plate, communicating with one pole of the source of electricity, whilst the other pole communicates with a hollow carbon electrode, vertically suspended within the furnace, the electric action being on a combination of the arc and resistance systems. The crucible is extended upwards by brick walls, the space enclosed being kept charged with the ore, slag, and charcoal, but a portion of the charcoal, preferably as briquettes, is fed in through the hollow vertical electrode. The carbon monoxide generated in the zone of fusion, burns to carbon dioxide at the expense of the oxygen in the ore, as it ascends, so that the ore is already partially reduced on reaching the base of the furnace. Separate openings are provided at different heights for running off the slag, and the molten metal. Compare Fr. Pat. 336,705 of 1903; this J., 1904, 376.

—E. S.

Alloy, or Ternary Metallic Composition. Soc. Anon. la Néo-Métallurgie. Fr. Pat. 341,639, March 18, 1904.

AN alloy, containing manganese, silicon, and aluminium, is prepared by heating with carbon in an electric furnace, the corresponding artificial or natural oxides or silicates, in such proportions that the alloy may contain, say, from 66.50 to 40 per cent. of manganese; from 27 to 40.50 per cent. of silicon; and from 6.50 to 19.50 per cent. of aluminium. The alloy is especially recommended for use in refining molten iron or steel, forming a fusible slag of manganese and aluminium silicates when added to the bath of molten metal. Compare Fr. Pat. 326,140 of 1902, and Fr. Pat. 331,276 of 1903; this J., 1903, 805 and 1136.

—E. S.

XII.—FATTY OILS, FATS, WAXES, AND SOAP.

Fat of the Wild Strawberry, Fragaria Vesca; Nature of the — J. Aparin. J. russ. phys.-chem. Ges., 1904, 36, 581—596. Chem. Centr., 1904, 2, 459.

THE fruits lose in the air, at the ordinary temperature, 84.28 per cent., and at 100° C., 92.04 per cent. of water. The air-dried fruits contain 5.53 per cent. of ash. The fruits dried at 100° C., yield, by extraction with light petroleum spirit, 11.64 per cent., the seeds, 20.85 per cent. of a brown oil of sp. gr. at 15° C./4° C., 0.9345; $[n]_D^{25} = 1.4790$;

it is easily soluble in ether, chloroform, benzene, and light petroleum spirit, and slightly soluble in alcohol. The oil is of a drying character; it has the iodine value (Hübl), 192.3. The insoluble fatty acids (88.20 per cent.) contain about 81 per cent. of linoleic acid and 10.5 per cent. of linolenic and oleic acids.—A. S.

ENGLISH PATENTS.

Garbage or Offal; Apparatus for Cooking — and *Removing the Oil therefrom.* C. S. Wheelwright and J. T. Fiske, jun. Eng. Pat. 14,482 and 14,483, June 27, 1904. XVIII. B., page 879.

Removing Oil or Grease from Garbage or Offal; Apparatus for — C. S. Wheelwright and J. T. Fiske, jun. Eng. Pat. 14,709, June 30, 1904. XVIII. B., page 879.

Butyrometers; Impts. in — E. E. O. Roewer. Eng. Pat. 20,630, Sept. 25, 1903. XXIII., page 882.

Soap; Floating —, and a *Process for the Manufacture of same.* F. W. Zimmermann and A. A. Stöhr, Chemnitz, Germany. Eng. Pat. 13,451, June 14, 1904. ✓

RESIN, wax, or the like is melted, and stirred continuously with caustic soda lye (density 42° B.) at about 44° F. until a crumbly, granular mass is produced. This latter is stirred into hot soap paste, to form a floating cake, which is afterwards mixed with ordinary soap liquor.—C. S.

UNITED STATES PATENTS.

Fatty Substances; Process of Separating Fluid Portions from Solid Portions of — W. B. Kerr, Medford, Mass. U.S. Pat. 766,628, Aug. 2, 1904. ✓

To separate the comparatively solid and liquid portions of fatty substances, the material is boiled with water, then cooled to about 120° F.; an aqueous solution of a vegetable digestive ferment (papain) is added, the mixture again boiled, the water drawn off, and the solid and liquid fatty matters are then separated by cooling and pressing.—H. B.

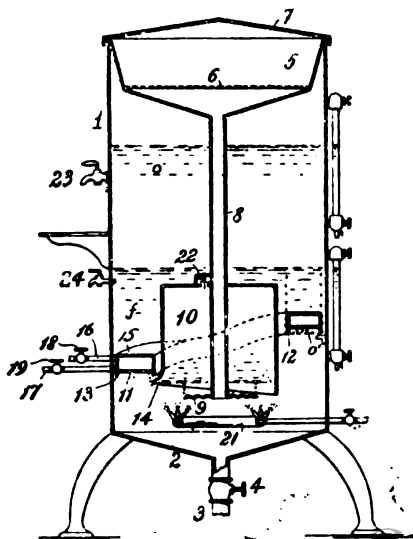
Drying Oil. W. N. Blakeman, jun. U.S. Pat. 767,682, Aug. 16, 1904. XIII. A., page 873.

FRENCH PATENTS.

Tar from Water-Gas; Process for Utilising the — [Solvent for Fats.] L. Scholvien. Fr. Pat. 340,995, March 7, 1904. III., page 861.

Oils; Apparatus for Purifying — D. H. McClelland and F. Risk. Fr. Pat. 341,400, March 17, 1904. ✓

THE apparatus consists of a cylindrical vessel 1, having a funnel-shaped bottom 2, in which the impurities and the



washing liquid collect, and from which they are drawn off by the valve 4. The oil to be treated is contained in the vessel 5, situated at the top of the cylinder. After passing through the strainer 6, and down the pipe 8, it escapes under the spreader plate 9, in a thin film, and rises through the washing liquid (the coarser impurities settling to the bottom) and collects in the bell 10. Any air escapes through the valve 22 and the pipe 8. The partly purified oil flows out of the bell 10, by the lip 14, to the under surface of the heating arrangement 11. This consists of a coiled tube of rectangular section, set obliquely as shown, and having the sides projecting downwards as at 12 and 13, in order to cause the particles of oil to follow the course of its under surface. The heating is effected by a current of steam or hot air which enters at 16, passes round the tube, and leaves at 17. The oil is thus heated and washed by the liquid *f*, and collects at *o'*, and then rises through the liquid, finally collecting in the upper part of the cylinder at *o*, from which the purified oil is drawn off by the tap 23. The warming and thorough mixing of oil and washing liquid, which enters thorough the pipe 21, are said to effectually purify the oil.—W. H. C.

Fats; Apparatus for Extracting Glycerin from —.
G. Col. Fr. Pat. 340, 521, Feb. 17, 1904. ✓

THE material is introduced into the top of a closed conical vessel *a*, which is heated by means of the perforated steam coil *g, g, g*. Having passed through the holes in the diaphragm *d*, it falls in a finely divided state upon the plates

e, e, e, e, and comes in contact with the steam. It next passes into the cylinder *h*, where it is beaten by the revolving paddles *k*, before passing through the tubes *m, m*, into the lower cylinder *l*. Here it is subjected to further beating in the presence of a regulated supply of distilled water from the tank *o*. Finally, the mixture passes into the separator *p*, which is provided with two outlet tubes, the upper *s*, for the residual fatty material and the lower *t*, for the aqueous solution of glycerin.—C. A. M.

Soap [Containing Benzene]; Manufacture of —.
J. F. G. de Roussey de Sales. Fr. Pat. 341,568, March 24, 1904. ✓

BENZENE or other hydrocarbon, is emulsified with the soap by means of a suitable mucilage, such as gum arabic, quince-gum, fish glue, linseed meal, and the like.—W. P. S.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

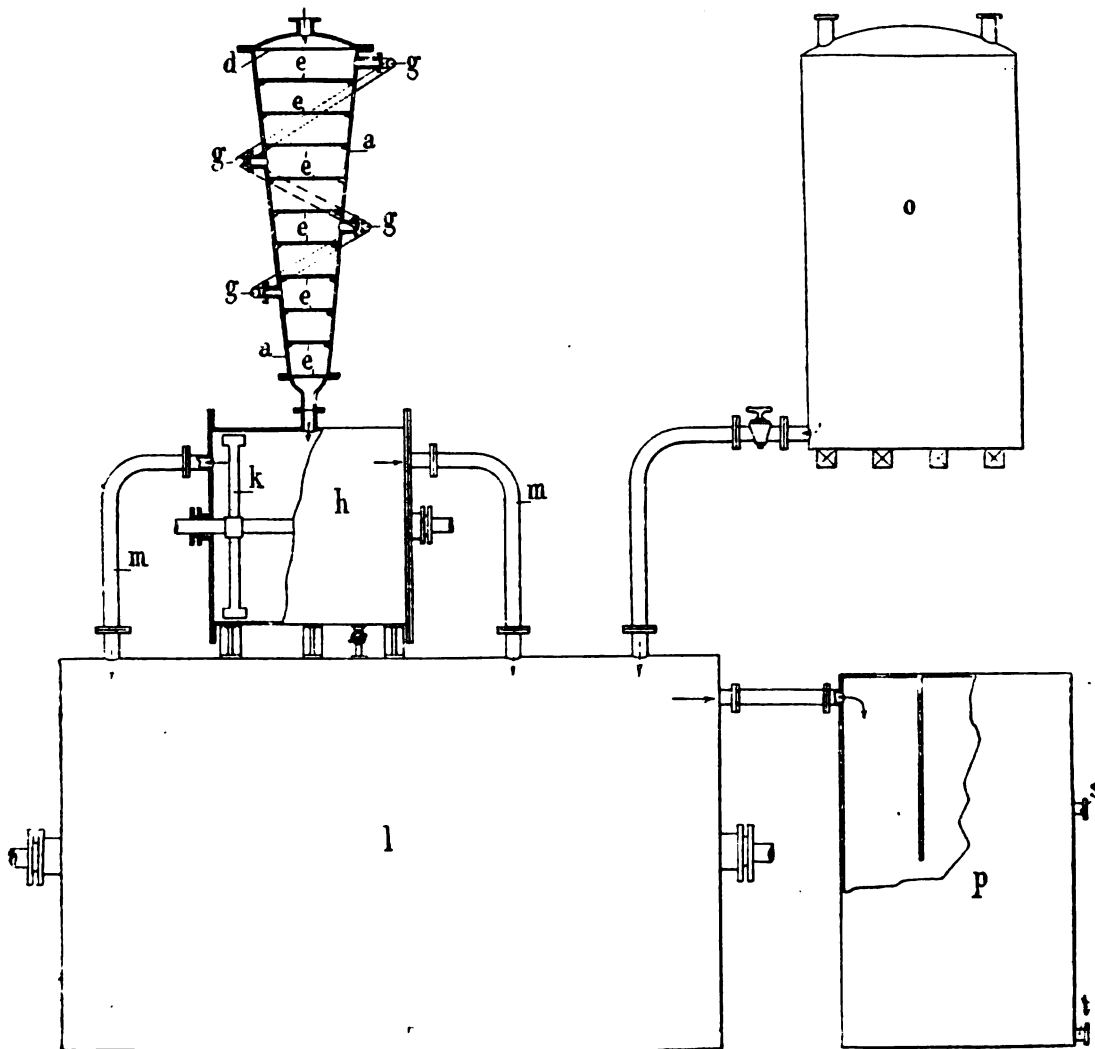
(A.)—PIGMENTS, PAINTS.

ENGLISH PATENT.

Antimony; Production of Oxysulphide of — [Pigment].

G. G. M. Hardingham, London. From the Soc. Minière e Fonderie d'Antimonio, Genoa. Eng. Pat. 19,505, Sept. 10, 1903.

ANTIMONY oxysulphide is produced as "fume" by heating antimony sulphide with a slight excess of coal, coke, or



other reducing agent, in a current of air which is regulated so as to avoid the ultimate reduction of the metal. (Compare Fr. Pat. 330,224 of 1903; this J., 1903, 1096.)—E. S.

UNITED STATES PATENTS.

Drying Oil. W. N. Blakeman, jun., New York.
U.S. Pat. 767,682, Aug. 16, 1904. ✓

A NON-DRYING fatty oil (85 parts) such as cotton-seed oil, and tung oil (15 parts) are mixed with a drier.—T. F. B.

Paint Composition or Mixture. W. N. Blakeman, jun., New York. U.S. Pat. 767,683, Aug. 16, 1904.

THE drying oil described in the previous specification is incorporated with a pigment.—T. F. B.

FRENCH PATENTS.

Lakes from Sulphide Dyestuffs; Process for Making —. Act.-Ges. f. Anilinfabr. Fr. Pat. 341,246, March 14, 1904.

LAKES are precipitated from solutions of sulphide dyestuffs containing sodium sulphide by oxidising the solution in presence of a suitable metallic salt, a lake-base being added if necessary. For example, a solution of 20 parts of "Sulphur Black T extra," 15 parts of sodium sulphide, and 25 parts of barium chloride is oxidised by blowing air through it. The resulting lake is filtered off, washed, and dried. Manganese dioxide, or other oxidising agent may be used, instead of passing the current of air through the solution.—T. F. B.

Pigment; White —. J. Gibaud and O. Bang.
Fr. Pat. 341,539, March 25, 1904.

THE addition of calcium sulphate or carbonate, or of magnesium oxide or carbonate is found not to diminish the covering power of zinc sulphide, and even to increase that of lithopone. As an example of the preparation of a pigment of the above composition, a solution of zinc sulphate is added to a solution of calcium chloride, a solution of an alkali sulphide (or barium sulphide) is added, and the precipitate is calcined.—T. F. B.

(B.)—RESINS, VARNISHES.

FRENCH PATENT.

Tar from Water-Gas; Process for Utilising the — [Solvent for Resins]. L. Scholvien. Fr. Pat. 340,995, March 7, 1904. III., page 861.

(C.)—INDIA-RUBBER, &c.

FRENCH PATENT.

Gutta-Percha-like Substance; Preparation of a —. E. H. Fayolle. Fr. Pat. 341,013, March 7, 1904.

PHENOL, cresol, or other similar substances (1 kilo), concentrated sulphuric acid (500 grms.), and glycerin (400 grms.) are heated together and allowed to cool. Water (400 grms.) is added and then formaldehyde (400 grms. of 40 per cent. strength) is gradually stirred in. After some hours the mixture is heated and the resulting oil is decanted off and washed, first with water and then with sodium carbonate solution. 1 kilo of this oil is then added to 2 kilos. of melted rosin and the mixture thoroughly incorporated, cooled slowly, and exposed to the air for some days until it acquires the desired consistency.—R. L. J.

XIV.—TANNING; LEATHER, GLUE, SIZE.

FRENCH PATENT.

Dyeing Skins for Gloves and other Purposes. P. Sorel. Fr. Pat. 341,450, March 19, 1904. VI., page 864.

XV.—MANURES, Etc.

ENGLISH PATENT.

Fertilisers and Cattle Foods; Manufacture of —. E. Meusel, Leignitz, Germany. Eng. Pat. 13,842, June 18, 1904.

BONE dust, or other bone preparation, is mixed with solutions of ferric chloride, sulphate, or nitrate, for the production of a fertiliser and cattle food.—N. H. J. M.

XVI.—SUGAR, STARCH, GUM, Etc.

Press-Diffusion Process; The Hyros —. K. Andrlík and V. Stanek. Z. Zuckerind. Böhmen, 1904, 28, 573—577.

THE authors give the results of the working of the Hyros diffusion process (Fr. Pat. 318,451 of 1902; this J., 1902, 1462) with a model apparatus which worked almost the whole season at a Bohemian sugar works. The beetroot chips were fed by hand into the first diffuser at the top, the juice flowed from it continuously, and the exhausted chips left the seventh diffuser automatically. The water pressure varied from 2·4 to 3·4 atmospheres, and the temperature in the battery was 77°—78° C. In six hours eight minutes, 960 kilos. of fresh chips were worked, the quantity of water used was 247·5 litres, and there were obtained 905·6 litres of diffusion juice at 80° C., and 295·6 kilos. of exhausted chips. In the ordinary diffusion the juice drawn off was 119·2 kilos. for 100 of beetroots, in the Hyros only 96·07, and 30·8 of exhausted chips. The density was 18·2° Balling against 15·0° by the ordinary process. The amount of dry solids in the exhausted chips was very high, being 21·94 against 6·79 per cent. by the ordinary diffusion. Although the chips were not exhausted so completely, they could be dried without further pressure and consequent loss of feeding value, whilst the sugar contained would be fully utilised and could not therefore be looked upon as loss. The amount of sugar remaining in the chips was 0·18 per cent. calculated on the beetroots, more than the total loss by the usual diffusion, but this is of no account compared to the economy of the process. The purity of the juice was 90·98 as compared to 90·0 by the diffusion in the 14 ordinary diffusers. The absence of all waste sweet waters and the smaller quantity of water used in working are both obvious advantages (see also this J., 1904, 831).—L. J. de W.

Juice in Raw Sugar Works; Purification of — by the *Lehmkuhl Process*. F. Janák. Z. Zuckerind. Böhmen, 1904, 28, 593—596.

RAW-SUGAR factories use from 2½ to 3½ per cent. of lime for the purification of the juice, not because such quantities are indispensable for purification, but because the filtration is difficult unless this amount of lime be used. The difficulty in filtration has been variously attributed to the presence of certain organic substances, to saccharates, to gelatinous mineral hydroxides, &c. Lehmkuhl came to the conclusion that it was due to albuminoids dissolved in the juice, and that if these were precipitated by chemical means, 1 per cent. of lime would suffice for purification and the filtration would proceed satisfactorily. Further, he found that it was necessary to heat the juice to 90°—95° C. in the presence of the chemical reagents. The juice is usually heated alone before the addition of lime, but as Classen and Hersfeld have shown, 9/10 of the albuminoids remain in solution under these circumstances. Although these are decomposed by lime into amino-acids, the salts thereby formed remain as molasses formers in the juice. The reagents employed are sulphuric acid and aluminium sulphate, and these are not found to produce any injurious effect at the temperature of 90° C. in the proportions employed during the time they are mixed with the juice, and the small quantity of salts remaining offers no disadvantage and does not appreciably affect the purity compared with the salts of amino acids. The process has been worked with advantage at the factories of Gross-Gerau, Melno, Amongies and Sokolnic. The coagulated albuminoids are not acted on by lime.—L. J. de W.

Water in Molasses; Determination of — G. Testoni. XXIII., page 883.

Hexoses; Reactions of — R. Ofner. XXIII., page 833.

ENGLISH PATENT.

Sugar; Manufacture of — G. Harrison, London. From F. Hlavati and Co., Genoa. Eng. Pat. 16,750, July 30, 1903.

To the saccharine materials during the diffusion process there are added substances which precipitate or prevent the extraction of the organic non-sugar bodies. Suitable substances are: gypsum, sulphates of metals of the magnesium or aluminium group, permanganates of the alkaline earths, peroxides of the alkaline earths or their equivalents, sulphides of hydrogen, nitrous oxide, carbon dioxide, and sulphurous acid. After saturation and carbonation, the slightly alkaline juice is treated in the vacuum-pan with a silicate of the aluminium or magnesium group which has previously been converted by an acid into a poly-silicate, and which combines with the alkali salts of the juice. A final decolorisation may be effected with zinc dust and subsequent carbonation. The use of silicon lead fluoride, supersaturated with lead, is also claimed for the purification of sugar solutions. — J. F. B.

FRENCH PATENTS.

Starch; Rotatory Apparatus for Catching and Automatically Grading — L. A. Morel. Second Addition, dated March 17, 1904, to Fr. Pat. 300,237, May 11, 1900.

In this addition the application of a receiver for the preparatory grading of starches before centrifugalising is claimed, together with the arrangement of a circular trough round the basket of the centrifugal apparatus so as to collect the water and carry it into the succeeding centrifugal vessel. — T. H. P.

Tar from Water-Gas; Process for Utilising the — [Solvent for Gums.] L. Scholvién. Fr. Pat. 340,995, March 7, 1904. III., page 861.

XVII.—BREWING, WINES, SPIRITS, Etc.

Barley; The Tannin of — H. Seyffert. Woch. f. Brau., 1904, 21, 483—485.

THE tannin of barley has a far lower affinity for albuminoids than the tannin of hops. Barley-tannin is only precipitated in combination with the readily coagulable albumins, whereas the precipitating action of hop-tannin extends to albuminoids, such as gluten, &c., which are non-coagulable in the ordinary sense. This is illustrated when one portion of a malt-wort made by infusion is boiled for two hours with a small proportion of hops, whilst another portion is boiled for half an hour without hops, and then for 1½ hours with the same quantity of hops. The total quantity of coagulated albumin in the first case is considerably less than in the second case and the former wort has a harsh flavour. When hop-tannin and barley-tannin occur simultaneously, as in the first case, in presence of readily coagulable albumins, the whole of the more powerful hop-tannin is precipitated in combination chiefly with the latter, leaving the barley-tannin and most of the soluble albumins dissolved in the wort. In the second case, the barley-tannin is precipitated in combination with the coagulable albumins during the preliminary boiling, thereby permitting the whole of the hop-tannin to be utilised subsequently for the precipitation of the gluten and similar undesirable

albuminoid constituents of the wort. Barley-tannin can be extracted from the grain by means of 75 per cent. methyl or ethyl alcohol, and is precipitated from its solutions by lead hydroxide. The author has isolated the tannin in a crude state, and has studied its relations towards certain constituents of wort. The alcoholic solution of barley-tannin when added to an aqueous solution of barley-albumin [leucosin] causes a heavy turbidity which coagulates on heating. In a saline solution of barley-globulin [edestin], the tannin solution causes a precipitate which dissolves on heating and re-appears on cooling. In an alcoholic solution of hordein it produces a turbidity which clears on heating to 60° C., but re-appears on cooling. Barley-tannin produces a precipitate in a solution of diastase, and the precipitate coagulates on heating. In a solution of Lintner's soluble starch the tannin solution produces a voluminous slimy precipitate, soluble on heating, but re-appearing when cold. When added in excess to unhopped wort, the tannin solution produces a turbidity which coagulates on boiling, but the wort becomes turbid when cold. In unhopped wort which has been coagulated by boiling, the tannin solution produces a heavy turbidity which clears on heating, but re-appears on cooling. Thus, apart from its astringent taste, it appears that the barley-tannin requires consideration as a possible cause of "beer-hazes;" it also probably has an injurious effect upon the yeast. — J. F. B.

Malt; Prior's Method of Determining the Degree of Friability of Cured — G. Bude. Woch. f. Brau., 1904, 21, 495—497.

Prior recently proposed (Bayer. Brauer. J., 1903, 13, 97—98) to determine the degree of friability in malt by sifting the grist and weighing the meal, a Seck mill and a Vogel sieve being used. The classification is as follows: very tender malt, containing at least 40 per cent. of meal; tender, with 35—40 per cent.; hard, with 30—35 per cent.; and very hard, with less than 30 per cent. of meal. These limits, however, are so narrow as to easily give rise to discordant results, more especially since the author's experiments with artificially moistened samples have shown that an alteration in the percentage of moisture is sufficient to displace one and the same malt from one category into another. In view of the results obtained he therefore proposes to adopt 5 per cent. of moisture as the standard, and where less than this quantity is present to deduct the difference from the percentage of meal found, the converse procedure being adopted when the moisture exceeds this mean. As an example of the effect of this precaution, one sample of malt yielded 38.8 per cent. of meal when the moisture content was 3.5 per cent., but only 29.6 per cent. when containing 11.4 per cent. of water. Under the Prior classification it would be considered in the former case as friable, but in the latter as very hard; whereas after the proposed adjustment, the percentages of meal become respectively 36.3 and 36.0 per cent. i.e., the sample is properly classed as friable. — C. S.

Concentrated Malt Extract; Sugars of — A. R. Ling and T. Rendle. Analyst, 1904, 29, 243—247.

FROM analyses of nine samples of malt extract, Korn (Ber. deut. Pharm. Ges., 1896, 6, 349) found their mean carbohydrate composition to be: maltose, 41.43—60.43; dextrose, 0.47—6.24; cane sugar, 0.33—3.60; and dextrin, 11.70—22.70. In their analyses, the results of which are given in the following table, the authors have determined the dextrose as dextrosazone (Chem. Soc., 1904, 84, 24), whilst the maltose was calculated from the reducing power

	1.	2.	3.	4.	5.	6.	7.	8.	9.
Sp. gr. at 15.5°/15.5° C.	1395.70	1395.12					1408.43	1377.83	
Maltose (apparent)	31.1	30.9	24.8	27.4	23.0	25.9	34.2	25.2	33.0
Dextrose	17.2	18.2	22.0	19.1	19.4	16.5	12.5	20.0	16.9
Dextrin (apparent)	9.8	6.6	10.0	9.8	13.5	12.3	9.9	6.7	7.8
Unfermentable matter (expressed as dextrin)	4.5	3.5	8.9	5.8	4.1				
Ash	1.45	1.40	1.58	1.64	1.03	1.21	1.34	1.61	1.33
Water	24.30	24.07	27.36	24.84	24.82	25.20	24.38	29.52	24.20
Diastatic power (Lintner)	30.8	27.2	32.3	25.6	32.2	28.0	30.2	40.5	61.7
Specific rotation. [α] _D	91.8°	90.5°	84.2°	89.8°	88.0°	89.6°	91.5°	81.1°	80.7°

less that due to dextrose and the dextrin from the rotatory power after deducting that of the dextrose and maltose; the small amount of cane-sugar, stated by Korn to be present, was neglected.

Of these samples the first two were not submitted to a higher temperature than 145° F. at any time during the mashing process, whilst Nos. 3—6 were mashed at a slightly lower temperature; these six were prepared from low-dried English malt.

As regards the presence of dextrose, it has been shown (this J., 1903, 1058, 1059, and 1204) that when any of the products of the incomplete hydrolysis of starch by diastase are isolated, and submitted to the further action of the enzyme, even at a temperature of 131° F., glucose is invariably formed. It is suggested that the dextrose of malt extracts may be due to the action, during the evaporation, of the diastase in the extract on the incompletely hydrolysed starch products formed during the mashing.

—T. H. P.

Starch; Note on the Hydrolysis of — by Diastase. J. S. Ford. Chem. Soc. Trans., 1904, 85, 980—983.

LING (this J., 1902, 983) has stated that Kjeldahl's law of proportionality does not hold for the diastase of air-dried malt. The author found, on the other hand, that two different preparations of Lintner's soluble starch gave similar results as regards "proportionality" with extracts from various barleys and air-dried (at 17°—40° C.) and kiln-dried malts. These results show that Kjeldahl's law is true for the diastase (amylase) in extracts of barley and air-dried malt as well as for that in kiln-dried malt. Having regard to the influence of slight traces of impurities on amylolytic action (see this J., 1904, 414), it is suggested that the discrepant results obtained by Ling and by the author are due to the use of starches of different degrees of purification.—A. S.

Starch; Final Degradation Products of — by Hydrolysis with Oxalic Acid, with special Reference to Dierssen's (Lintner's) "Isomaltose." F. Grütters. Z. angew. Chem., 1904, 17, 1169—1179.

THE degradation products obtained consisted of aehroodextrins I and II, maltodextrin γ , maltose, dextrose, and a small proportion of levulose. These are the same as the products furnished by diastatic action, except that in the latter case maltodextrin γ is replaced by maltodextrin β , which exhibits different constants and behaves differently towards diastase. The author, however, believes that both these dextrins occur simultaneously, but in varying proportions, this view being supported by the fact that the conversion into maltose is sometimes very imperfect, and at others almost complete. The divergent behaviour of various "isomaltose" preparations towards malt extract is also regarded as indicating that the more resistant maltodextrin γ occasionally preponderates as the lowest member of the dextrin series. Like Lintner and Dierssen he failed to isolate maltose in the pure, crystalline state from the syrups; but neither could this be accomplished from mixtures of maltose and dextrin, which, moreover, gave osazones resembling "isomaltosazone." Furthermore, the statement by Ost that he has finally succeeded in crystallising maltose from the syrups seems to have deprived the "isomaltose" theory of its last support.—C. S.

Brewing; Employment of Sugar in —. C. Moreau. La Bière, 1904, 12, 98—104.

COMMERCIAL glucose is of irregular composition, and contains undesirable ash constituents; its use in brewing gives unsatisfactory fermentations besides entailing extra fining. Saccharose, whilst free from these defects, is not directly fermentable, and if the necessary inversion be left to the action of the pitching yeast, the latter may be overtaxed and caused to degenerate. Again, this sugar increases the temperature of fermentation by about 2° C., the attenuation is greater by about 3 per cent., the wort does not break so well in the copper, nor is the beer so bright when fined, nor are the flavour and aroma so good as when invert sugar is used. Commercial invert sugar, however, lacks uniformity, but this difficulty can be overcome by inverting saccharose

with yeast in the brewery, at a temperature (55° C.). The author made trial brews with this invert sugar added to the malt in proportions ranging between 12 and 55 per cent. The best result was obtained with 15—16 per cent., this quantity leaving the beer unchanged in flavour, and the yeast vigorous and free from degeneration; and the beer kept unusually well, showing good condition and a firm "head." With larger proportions of sugar the results were less favourable. No trace of yeasty flavour could be detected from this yeast-inverted sugar, the taste observed in the sugar itself entirely disappearing when the wort was boiled; and the quantity of proteids introduced in the same way is smaller than in the corresponding weight of malt. Over-attenuation can be prevented by mashing so as to produce a wort containing more dextrin and by the use of about 2 per cent. of high dried malt. For priming, this sugar is less suitable, owing to its yeasty taste, and the inversion is preferably effected by boiling the 20 per cent. solution of saccharose with 1 per cent. of tartaric acid for 20—30 minutes. No injury accrues to the beer from the introduction of this small quantity of acid, and even when 12 per cent. of the malt is replaced by sugar inverted in this way, it is stated, the degree of acidity does not rise above the normal limit. The author considers that the use of sugar would improve the cold flavour of North of France beers, which lack palate-fulness owing to the loss of dissolved carbon dioxide during fermentation and fining. At the same time a slight economy would be effected in the cost of production.—C. S.

Culture Yeasts; Studies on the Behaviour of Certain Races of — at Various Temperatures. W. Henneberg. Woch f. Brau., 1904, 21, 347—349; 374—376; 400—403; 432—434; 447—451; 457—460; 470—476.

THE subjects dealt with in this series of investigations comprise.—I. *Death of the Yeast Cells:* Diagnosis by appearance and staining; appearance according to the manner of death; death with simultaneous liquefaction; death caused by high temperatures and storage. II. *Cell-wall:* Agglutination; racial variations; permanence; rupture. III. *Nucleus.* IV. *Glycogen:* Detection; appearance and disappearance at various temperatures; persistence after death from different causes and in presence of various substances. V. *Fat:* Its secretion in excess probably pathological; persistence after death; racial and hereditary tendencies of cells rich in fat; sparing solubility of the fat in ether. VI. *Peptase:* Detection; racial differences; conditions which influence auto-digestion; comparative resistance of dead cells to proteolysis; microscopic characters of cells during proteolysis; resistance of peptase to high temperatures and storage; distinction between auto-digestion and the gelatin-liquefying power of living yeast. VII. *Catalase:* Detection; occurrence; diffusibility; behaviour towards heat. VIII. *Zymase:* Its early disappearance from liquefied yeast. IX. *Invertase:* Its high powers of resistance; relative abundance in bottom fermentation yeasts. X. *Putrefaction:* Non-occurrence at temperatures above 38° C.; bottom yeasts putrefy more readily than top yeasts; various lactic acid bacteria probably play a part in starting putrefaction; presence of active enzymes in liquefied yeast is probably inimical to putrefaction.—J. F. B.

Wild Yeast Infection. A. C. Chapman. J. Inst. Brewing, 1904, 10, 382—396.

THE chief sources of wild yeast infection in English breweries are said to be direct aerial infection at the refrigerating stage, indirect aerial infection from dust in the refrigerator or fermenting room, and infection due to nests of micro-organisms in defective fermenting tuns or yeast backs. On the other hand, infection due to very impure pitching yeast or to dry hopping is rarely met with. Provided the wort is run off the cooler before the temperature falls below 140° F., there is little risk of infection at that stage; but it is advisable to screen the ventilation openings with fine linen, moistened with water or dilute salicylic acid, and the same method should be adopted in the refrigerator room, or the latter apparatus be itself enclosed in a casing of similar character. Dust infection may be prevented by cleanliness,

and that from defective plant by shaving down the tuns to remove all soft places and spongy surfaces, and treating them for several days with a strong solution of calcium bisulphite. This method proved efficacious in two cases of infection by *S. pastorianus* I. The author also mentions an instance of infection by *S. apiculatus*, occurring in the winter months, whereas this yeast is seldom encountered except in summer and autumn. From the attendant circumstances it was concluded that the organism had found its way into the brewery earlier in the year, and lodged in accumulations of dust, being afterwards disturbed by wind.—C. S.

Fermenting Room [Breweries]; Infection in the —.
E. de Fine-Bunkeflod. Z. ges. Brauw., 1904, 27, 573—576.

To prevent infection of the beer by micro-organisms it is essential that the vats should be well cleansed with hot water, followed by spraying or brushing over with an antiseptic, preferably one of the fluorine preparations (this J., 1904, 757). *Sarcina* germs are frequently found on dirty floors, and the latter should therefore be kept clean. The best material for fermenting room floors is asphalt with a little sand, or cement, crevices being thus avoided. The number of germs gaining access to the wort from the air is relatively small, and the authors failed to detect any injurious infection from this source. More importance attaches to the use of uncontaminated pitching yeast. A greater potential source of danger is water falling from the ceiling in drops. The ceiling should be frequently scraped and disinfected, hot lime wash or bleaching powder being cheapest. *Sarcinae* have also been found on walls splashed with fermenting wort; and where contamination arises in this way the old plaster should be scraped off before disinfection.—C. S.

[Beer] *Sarcina* Infection. N. H. Claassen. Z. ges. Brauw., 1904, 27, 528—529.

In reply to the criticisms of Will and Braun (this J., 1904, 757) the author states that he is unaware that *sarcina* grown in ammoniacal yeast-water has ever been found capable of growing in beer; on the other hand, he has isolated *Pedococcus damnosus* and *P. perniciosus* from beers of various origin, and found the cultures produce *sarcina* sickness in beer but refuse to grow in the above medium. Hence he feels justified in the conclusion that ammoniacal yeast-water is an entirely unsuitable reagent in brewery tests.—C. S.

Fermentation Processes; Review of Recent Improvements in —. H. Wichmann. Woch. f. Brauw., 1904, 21, 455—456.

In the use of pure yeast the best results are only obtained when the propagation of the pure yeast is worked as an integral part of the routine fermentations and under identical conditions. In Delbrück's "natural" pure cultivation the conditions are chosen so as to cause the culture yeast to suppress all foreign organisms. In this natural process of selection without the isolation of single cells, attention must be devoted to the choice of a nutrient material in accordance with the enzymatic power of the species of yeast; also to the demands of the yeast for oxygen, its sensibility towards its own excretion products, acids, and antiseptics, and towards unfavourable temperatures. The use of pitching-vats, which is on the increase, is of assistance in obtaining pure yeast. Purity may also be favoured by conducting the fermentations at higher temperatures, whereby wild yeasts are placed at a disadvantage. Octagonal vats constructed of glass plates with embedded wire have been introduced recently as substitutes for wooden fermentation tuns. For very large-sized fermentation vats only iron is available; these large vats are rendered indifferent towards beer by a special internal coating according to Lapp's process.—J. F. B.

Beer; Filtration of —. Bauer, Jakob, and Riefenstuel. Z. ges. Brauw., 1904, 27, 601—607.

THE experiments made show that filtration makes the beer brighter and removes most of the yeast cells present, thus enabling the brewer to send out beer sooner and also to clarify beer that has been rendered quite turbid by yeast.

Filtration improves the keeping properties of the beer, and delays the appearance of sediment or haze. To enable these advantages to be realised, the filtering material must be kept in a sterile condition and replaced at intervals. The used mass should be washed at once, a temperature of 70°—75° C. sufficing to destroy the micro-organisms. Boiling makes the mass lumpy, and is only required previous to the first time of using. The cleansed mass should be at once re-packed in the frames and placed in the filter, to obviate risk of infection from exposure to the air. It is inadvisable to use the same mass several days in succession with merely a washing in the filter in the intervals. On no account should beer be left standing in the filter. The latter must be thoroughly cleaned before use, hot water being the most suitable agent to follow the usual methods of cleaning. Owing to the risk of causing metallic haze, it is inadvisable to treat the filter with antiseptics liable to loosen the incrustation.—C. S.

Amyl Alcohol; Origin of — in Fermented Liquids.
Windisch. Z. Spiritusind., 1904, 27, 311.

THE author gives an account of the experiments of Rayman and Kruis on the chemistry of fermentation. In 1892 they found that pure cultures of normal saccharomycetes form no other alcohol than ethyl alcohol at the ordinary brewery temperatures; later on, in 1896, they showed that the culture yeasts are capable, under certain conditions, which they could not clearly define, of yielding fusel oil without the help of bacterial action (see this J., 1896, 465). In continuation of this work, these authors inoculated a series of nutrient sugar solutions, both with yeasts rejuvenated by culture through numerous generations and with others which had finished their alcoholic fermentation years before. It was found that neither unfavourable composition of the nutrient medium nor the age and physiological condition of the yeast cells influence the formation of amyl alcohol. On the contrary, it was shown that amyl alcohol is a product of the culture yeast, that it is formed only in presence of certain carbohydrates, and that it is the nature of the nutrient medium on which the formation and yield of amyl alcohol mainly depend. None of the artificial nutrient solutions yields a trace of amyl alcohol with pure distillery yeast, but with a clear, sterile, barley-malt wort, prepared as in the distillery, amyl alcohol always appears. From this it is concluded that the source of this alcohol is not the hexoses, but fermentable sugars formed by the hydrolysis of other polysaccharides occurring in the raw materials used. On oxidising a mixture of sugars containing a large preponderance of one constituent, the course of oxidation of the mixture depends upon the course of oxidation of the sugar in excess. Thus, in presence of a sugar which readily oxidises, dextrose yields no saccharic acid but oxalic acid. Rayman and Kruis suggest that something similar possibly occurs in fermentation.—T. H. P.

Metals; Influence of — on Fermenting Liquids.
L. Nathau. Centrabl. f. Bact., 1904, 12, 93. Biochem. Centrabl., 1904, 2, 690.

CIDERS must offer greater resistance to the action of metals than beer worts, notwithstanding the fact that they dissolve more of the metals. There is considerable difference in the influence of different metals on the fermentation. Thus copper, zinc, brass, bronze, and rough iron have a strong restrictive influence; tin and lead have less effect; whilst the following metals are only slightly injurious: Polished iron, silver, nickel, gold, polished tin, and aluminium.

—C. A. M.

Wine Making; Australian —, with some Notes on the Use of Pure Wine Yeasts. F. Stoward. J. Inst. Brewing, 1904, 10, 421—447.

Wine Making.—Fermentation is generally conducted in cement-lined brick tanks, holding about 1600 galls. For producing dry red wine, the bottom of the tank is covered with a layer of stalks, to facilitate drainage and impart tannin, a similar layer being placed on the top of the mash of skins and juice. The skins are kept from rising to the surface of the must by means of a false head of light battens, held down by screw jacks, which also serves to support the

attemperators. Yeast from a tank in active fermentation is sometimes added, or occasionally pure cultures are used. No aeration of the must is necessary, but attempts are made to maintain uniformity of temperature by means of a circulating pump, better results being, however, now obtained by piercing the cap of skins with a number of short bamboo vents. When fermentation begins, the temperature in the cap is several degrees higher than that of the must above the false head, the difference being due to the low conductivity of the skins, and the difficulty experienced by the carbon dioxide in escaping through them to the surface. In about six days the must is racked into wooden vessels, and left for a couple of months to clarify, an operation that is repeated previous to blending. For dry white wines, the juice is left in contact with the skins for only 24–36 hours, and is then fermented by itself; whilst, for sweet wines, either red or white, the fermentation is arrested at a certain point by the addition of grape spirit.

Acid: Sugar Ratio.—Australian musts contain more sugar in proportion to acid than do those of French or German origin, the relative quantities of acid per 100 parts of sugar being as follow:—Victoria must, 2.30–3.14; South Australian, 2.82; French, 4.13; and German 5.65 parts. This is because the wines being of more robust type need a high sugar content for their manufacture.

Pure Yeast.—The author has experimented with pure cultures of Chateau Lafitte and Richbourg yeasts, the sub-cultures of which were employed to ferment batches of must, a third batch being left to ferment spontaneously. In addition to giving a more regular fermentation, and suppressing the development of *S. apiculatus* infection, the culture yeasts furnished a superior product, the Chateau Lafitte giving a specially fine bouquet after two years' storage, whilst the Richbourg proved better than the control batch, which lacked cleanness of taste. It was noticed in laboratory experiments that the use of pure yeasts lightened the colour of the wine.—C. S.

Alcohol; Hydration of — by Calcium and Barium Oxides. L. Crismer. Bull. Soc. Chim. Belg., 1904, 18, 128–129.

THE author tests the degree of hydration of alcohols by a very sensitive method, viz., by determining the lowest temperature at which they mingle completely with a paraffin hydrocarbon; this he calls the "critical temperature of solution." With a given solvent these temperatures show equal increments for an additional CH_2 group in the alcohol molecule; thus in kerosene ("huile de paraffine") the temperature is 166° in the case of methyl alcohol, 89.7° with ethyl alcohol, and 13.5° C. with propyl alcohol, the differences being 76.8° and 76.2° respectively. Having prepared a really anhydrous methyl alcohol, which has a critical temperature of 37.5° C. in "gasoline," the author finds that distillation from quicklime freshly prepared from marble actually leads to hydration, raising the critical temperature to 39.6° (first distillate) and even 66° C. (last distillate), corresponding to 0.12 per cent. and 2 per cent. of water respectively. The reaction is presumably expressed by $\text{CaO} + 2\text{CH}_3\text{OH} = \text{Ca}(\text{OCH}_3)_2 + \text{H}_2\text{O}$. Hence the familiar process of dehydration with quicklime is illusory. Anhydrous ethyl alcohol is hydrated by barium oxide but not by quicklime.—W. A. C.

Malt Analysis. A. R. Ling. XXIII., page 884.

Copper Sulphate; Method of Determining the Purity of — for Use in the Vineyard. C. Montanari. XXIII., page 883.

Boric Acid in Cider, Fruits, &c.; Determination of —. A. H. Allen and A. R. Tankard. XXIII., page 883.

Abrastol in Wine; Detection of —. E. Gabutti. XXIII., page 884.

Aldehydes in Wine, &c.; New Method for the Determination of —. L. Mathieu. XXIII., page 884.

ENGLISH PATENTS.

Grain for the Production of Malt; Treatment of —. J. Sleeman, Portishead, Somerset. Eng. Pat. 17,975, Aug. 19, 1903.

THE apparatus described permits the whole process of malting to be carried out in a combination or series of appliances, the complete plant consisting of a washing and steeping drum or cylinder, two germinating drums, two withering cases, and two drying machines. The washing and steeping drum consists of a perforated cylinder mounted so as to revolve in a tank of water. It is fitted with internal paddles for raising the grain and allowing it to fall again. A perforated tube may be fitted centrally in the drum to supply air to the latter. The washed grain is then passed through a shoot into the germinating drum. A suitable form of this part of the plant is described in Eng. Pats. 18,412, 1898 (this J. 1899, 936), and 2109, 1899. The air used during the germination is previously passed through a moistening apparatus. Withering is carried out in a similar drum, but the grain space is much narrower. The malt then passes either to an ordinary drying kiln, or to drying and curing machines. For curing, the perforated case is preferably enclosed in an impervious casing, to enable the heated air contained therein to permeate the grain, instead of forcing large volumes of air through it.

—W. P. S.

Grain for Malting, Distilling, &c.; Apparatus for Aerating — during the Steeping Process. C. F. Henry, Dublin. Eng. Pat. 19,472, Sept. 10, 1903.

THE apparatus consists of a cylindrical perforated casing of circular or polygonal section, mounted horizontally on pivots projecting from the end walls. The cylinder is divided radially into compartments into which the grain is loaded through longitudinal doors. The casing is partially immersed in the steeping vat in such a manner that the grain in one compartment is aerated, while that in the other compartments is submerged.—J. F. B.

Malting and Drying Drums. T. McKenna, London. From Holst and Fleischer, Christiania. Eng. Pat. 11,752, May 21, 1904.

IN malting grain between two concentric perforated drums, the inner drum being utilised for the admission of air, a perfect distribution of the moist air during germination is ensured by maintaining the whole of the perforations of the inner drum freely open. When, however, the malt is to be dried by the admission of dry heated air, which causes a considerable shrinkage of the grain, the upper portion of the inner drum is closed by deflecting plates or dampers, which swing round on pivots and cover the perforations. Thus the hot air is compelled to pass through the denser, lower layers of the grain. For kilning malt with roasted aroma, the deflecting plates are heated by means of steam pipes attached to their lower surfaces and constructed to swing with the dampers.—J. F. B.

Malting Drums. H. Schreier, Sheboygan, Wis., U.S.A. Eng. Pat. 14,517, June 28, 1904.

A ROTARY malting drum is provided with a discharge opening, covered by a slide, and also with internal spiral conveyors mounted on a shaft so as to move the contents of the drum towards the discharge opening. The discharge opening may be in the longitudinal centre of the drum, and the conveyors arranged so as to deliver the contents from opposite ends to the centre. The driving gear consists of a bevel wheel on the outer end of a conveyor shaft, engaging with a corresponding wheel, which is mounted on a transverse shaft and can be displaced on the same so as to clear the conveyor wheel while the drum is being rotated.

—C. S.

FRENCH PATENTS.

Grain; Process for Drying —. Brauerei Gross-Crostitz Akt.-Ges. Fr. Pat. 341,709, March 28, 1904.

SEE Eng. Pat. 6975 of 1904; this J., 1904, 618.—T. F. B.

Wines and Spirits; Improvement [Electrical] of —, and Sterilisation of Liquids. V. Dorn. Fr. Pat. 341,671, March 26, 1904.

THIS process, which serves equally well for the sterilisation of all kinds of liquids and of substances containing liquids and for the artificial ageing and improvement of the products of alcoholic, acetic or lactic fermentation, consists in introducing oxygen or oxygenated substances into the materials to be sterilised or improved and then subjecting them to static electrical discharges.—T. H. P.

Denaturation of Industrial Alcohol by Carboline and its Compounds. A. Leoni, A. Pelizza, and E. Stringa. Fr. Pat. 341,617, Feb. 2, 1904.

CLAIM is made for the use as a denaturing agent, of "carboline," which is a mixture of readily and moderately volatile oils obtained by the distillation of bituminous matter.—T. H. P.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(A.)—FOODS.

Boric Acid in Cider, Fruits, &c.; Determination of —. A. H. Allen and A. R. Tankard. XXIII., page 883.

Butyrometers; Impts. in —. E. E. O. Roewer. Eng. Pat. 20,630, Sept. 25, 1903. XXIII., page 882.

ENGLISH PATENTS.

Centrifugal [Milk] Separators. M. Dall, Copenhagen. Eng. Pat. 12,161, May 28, 1904. Under Internat. Conv., May 28, 1903.

THE fittings of the revolving portions of centrifugal separators are constructed of materials such as ebonite, wood, celluloid, &c., having approximately the same specific gravity as the liquid treated. The object is to prevent the deformation of the fittings resulting from the action of centrifugal force.—W. H. C.

Preservative for Food. A. Fölsing, Offenbach-on-the-Maine, Germany. Eng. Pat. 13,689, June 16, 1904.

THE food, such as meat, fish, butter, or jams, is sprinkled, covered or mixed with trioxymethylene, in the form of a powder or of an aqueous solution.—W. P. S.

Fertilisers and Cattle Foods; Manufacture of —. E. Meusel. Eng. Pat. 13,842, June 18, 1904. XV., page 873.

(B.)—SANITATION; WATER PURIFICATION.

Mersey and Irwell Joint Committee. Report by R. A. Tatton, Chief Inspector, July 5, 1904.

A REVIEW of the progress made towards the purification of the rivers of the watershed during the past 12 years is given. The area under the jurisdiction of the joint committee consists of seven county boroughs, Manchester being the principal one, 14 non-county boroughs, 68 urban districts, and 11 rural districts; with a total population of 2,502,103, and a rateable value of 2,390,446*l*. The watershed comprises five rivers—the Irwell and the Roach, with 286 manufacturers upon their banks; the Irk, with 45 manufacturers; the Medlock, with 15; and the Mersey, with 98—giving a total of 444. The tipping of cinders into the streams, which was a very common practice 12 years ago, has practically ceased. The sludge accumulating in mill lodges is now seldom discharged into the rivers, but pollution still occurs through the running off of lodges in which polluted water is used, the putrescent water carrying mud with it. Fewer complaints are now received of pollution from stone-polishing works. Tables and diagrams are given showing the gradual progress made in works for preventing pollution from liquid sewage. In May 1892 only 27 of the authorities in the watershed had sewage works in operation; in May 1904 there were 80 in operation in urban districts, and 10 in rural districts.

In 1892 there were 26 urban authorities which had no scheme of sewage purification; now there are only two, and of those one—Ramsbottom—has its works nearly completed, and the other—Bollington—has received tenders. In the appendix to the report particulars are given of the methods of treatment adopted by each authority with works in operation. The adoption of bacteria beds, in place of land, is largely on the increase, creating a large demand for suitable material. Special attention is directed to the pollution caused by the discharge of untreated storm water through storm overflows, and it is recommended that if the storm water cannot be filtered, it should at least be allowed to pass through settling tanks to remove solid matter. Fairly satisfactory improvement is noted in the treatment of the dry weather flow of sewage. In the section dealing with liquid by-products of a polluting character, tables are given showing the number of manufacturers in each industry where purification works are necessary, and the progress made since 1893. Of the 444 on the rivers, there were, in October 1893, 45 which had efficient works of purification; in May last there were 306. In 1893, 77 works had plant constructed, but not efficient; now there were 133 works in a similar position. At the first date there were 191 manufactories at which no treatment was adopted; now there were only five. Out of 120 dyeworks, 38 had now efficient plants; out of 75 bleachworks 56; of 59 woollen trades, 44; of 48 printworks, 38; of 12 breweries only three were now efficient; and of five factories of fellmongers, only 1. In addition to these, effluents from a large number of factories drain into the sewers. No proceedings have been taken against manufacturers during the last six years, and it is seldom that the suggestions made by the joint committee are rejected. Considerable trouble is caused by the effluent from fellmongers and bleachworks, owing to the large area required for the necessary filtration. A hopeful direction in which progress has been made is in the recovery of waste products. Interesting facts are given to show the improvement which has taken place in the rivers during the last 12 years, but it is stated that much yet remains to be done, some of the rivers, especially the Irk and the Roach, being in a highly polluted condition.—G. J. F.

Chemical Disinfectants; Action of certain —. Schumburg. Z. f. Hyg., 1903, 45, 125. Proc. Inst. Civil Eng., 1904, 156, 66—67.

SCHÜBER has stated that bromine in a solution of 0.06 per 1000 is not invariably fatal to cholera vibrios in drinking-water. This statement is confirmed, but it was found that only in very rare cases are cholera vibrios capable of resisting the action of the disinfectant. The same is the case with a 1 per 1000 solution of mercuric chloride and a 5 per cent. solution of carbolic acid (phenol). The author considers that since the above disinfectants, which are the most powerful it is possible to use, are not certain to destroy all germs within a short time (say in three-quarters of an hour), no chemical mode of disinfection is to be absolutely depended upon, under all circumstances, to prove fatal to bacteria. Disinfection by means of heat is therefore to be preferred to the use of chemicals.—A. S.

Manganese in Drinking Water; Determination of —. G. Baumert and P. Holdefleiss. XXIII., page 883.

ENGLISH PATENTS.

Refuse-consuming and Gas-producing Furnaces. L. Tobianaky, Brussels. Eng. Pat. 12,361, May 31, 1904.

THE refuse destructor consists essentially of a retort, in which the waste substances are dried and distilled; it is arranged above a combustion chamber which is fed with the coke produced in the retort. The apparatus is worked with the minimum admission of air, so that the steam, air, and vapours passing down from the retort, and up through the coke in the combustion chamber, give rise to a poor gas free from smoke, containing carbonic oxide and hydrogen. To render the gas suitable for use for motive purposes, it is enriched to a standard calorific value, the apparatus for automatically regulating the enrichment consisting of a small gas motor, burning the gas, and having its governor

connected with the supply valve for the carburetting material, a reduction in the speed of the motor causing a corresponding increase in the supply of the carburetting material. The enrichment is effected by feeding tar into the fuel in the furnace, distilling oils in a special retort above the fire, passing the gas through a spray of light hydrocarbon, or mixing it with rich gas from any suitable source.—H. B.

Garbage and Offal; Apparatus for Cooking —, and Removing the Oil therefrom. C. S. Wheelwright, Bristol, R.I., and J. T. Fiske, jun., Burrillville, R.I. Eng. Pat. 14,482, June 27, 1904. ✓

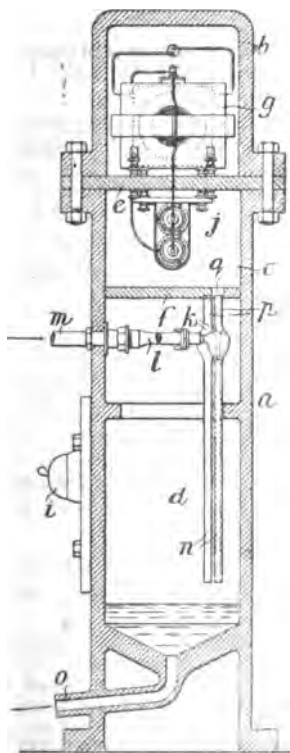
THE apparatus consists of a digester in combination with a trapped water and oil receiver placed above the digester. The trap consists of the receiver itself and a stand-pipe opening directly from the digester and extending upwards in the receiver. Taps are provided for drawing off oil and water at different levels from the latter. A strainer is placed at the upper part of the digester. The steam enters through pipes at the lower end of the digester, deflectors being fitted over the end of each pipe. (See also U.S. Pat. 709,836, 1902; this J., 1902, 1285).—W. P. S.

Garbage or Offal; Apparatus for Cooking —, and Removing the Oil therefrom. C. S. Wheelwright, Bristol, R.I., and J. T. Fiske, jun., Burrillville, R.I. Eng. Pat. 14,483, June 27, 1904. ✓

THE steam digester described in the preceding patent is provided with a second chamber apart from the oil and water receiver. The two are connected by a valved circulation pipe and a trapped chamber is placed above the second chamber to receive oil, steam, or water passing through the circulation pipe. A pipe leading from the bottom of the second chamber allows water to be drawn off and injected into the digester to replace the oil and water withdrawn from the latter.—W. P. S.

Sterilising Water by means of Ozone; Apparatus for —. R. F. Wood-Smith, London. Eng. Pat. 18,193, Aug. 22, 1903.

THE outer casing, *a*, of the apparatus is divided into three chambers, *b*, *c*, and *d*, by the horizontal partitions, *e* and *f*.



The upper chamber, *b*, contains a step-up transformer, *g*, for raising a low tension alternating current to current of a tension suitable for the ozoniser, *j*, of the Andreoli type, in the middle compartment, *c*. The water to be sterilised is supplied through the pipe, *m*, to three branch pipes, *l*, forming the horizontal side tubes of the three filter pumps, *k*, the upper nozzles, *p*, of which, fit into orifices, *q*, in the partition, *f*. The transformer is controlled by the switch, *i*, and supplies the necessary current to the ozoniser, *j*, which ozonises the air passing into *c* through apertures in *e*. The water, supplied through *m*, draws the ozonised air through the nozzles, *p*, and the water and air being brought into intimate contact in the discharge pipes, *n*, the water leaves the apparatus at *o* in a completely sterilised condition.—B. N.

Removing Oil or Grease from Garbage or Offal; Apparatus for —. C. S. Wheelwright, Bristol; and J. T. Fiske, jun., Burrillville, R.I., U.S.A. Eng. Pat. 14,709, June 30, 1904. ✓

THE garbage, &c. is cooked in the digester by the introduction of water and fresh steam. By mechanical means the solid parts of the garbage are held back, whilst the grease and water pass to an upper chamber, and are separated by gravity.—N. H. J. M.

(C.)—DISINFECTANTS.

ENGLISH PATENT.

Gaseous Germicide and Insecticide; [Electrical] Process and Apparatus for producing a —. R. Marot, Paris. Eng. Pat. 14,372, June 25, 1904. Under Internat. Conv., Nov. 30, 1903.

A MIXTURE of sulphur dioxide and air is subjected to the silent electric discharge, or is forced through a chamber containing electrodes between which sparks are caused to pass. The gaseous mixture, which now contains some sulphuric anhydride, and is therefore capable of acting as a germicide as well as an insecticide, is mixed with a further quantity of air, and driven by means of a fan into the space to be disinfected.—A. S.

FRENCH PATENT.

Wines and Spirits; Improvement of —, and Sterilisation of Liquids. W. Dorn. Fr. Pat. 341,671, March 26, 1904. XVII., page 878.

XIX.—PAPER, PASTEBOARD, Etc.

Kollergang and Pulping Machine. U. Wochenbl. f. Papierfabr., 1904, 35, 2530—2531.

THE author enumerates the relative points of merit of the Kollergang, as compared with the pulping machine of the Würster or Dietrich type.

Advantages of the Kollergang.—The Kollergang, in combination with a strainer, is almost indispensable for pulping up unsorted waste paper and trimmings containing string, binding thread, and other hard and elastic impurities; the stuff can be prepared either "free" or "wet," according to the density of the charge, moisture, and length of treatment; on this account a better felting and, consequently, a tougher paper and better retention of clay and fine fibres can be ensured. The Kollergang, moreover, is the only satisfactory means for pulping up hard papers, such as imitation parchment and strong glazed papers, since it has a kneading and rubbing action.

Disadvantages of the Kollergang.—The Kollergang necessitates a small and intermittent production; the period of treatment cannot be controlled; a certain amount of injury to the fibre cannot be avoided; the treatment is a lengthy one; the service is somewhat dangerous, and the up-keep is costly; any foreign bodies, such as wood or coal, are ground up with the pulp, which also becomes contaminated with sand from the stones.

Advantages of the Pulping Machine.—For "machine-broke" and clean-sorted waste paper, and for all sorts of dry wood-pulp, the pulping machine is vastly superior to the Kollergang. The work is continuous and the output is large; the operation is rapid and cheap; the machine

having been adjusted, the condition of the prepared stuff is always constant; the fibre is improved; the service is perfectly safe; space is economised; foreign impurities are discharged intact.

Disadvantages of the Pulping Machine.—Unsorted waste papers may cause clogging and, ultimately, a breakdown of the machine; the treatment is not sufficiently drastic for certain kinds of hard paper; the machines cannot be used for the preparation of "wet" stuff.

—J. F. B.

Paper Dyeing. J. Nonnenmühlen. VI., page 864.

ENGLISH PATENT.

Paper; Manufacture of Waterproof — and the like. G. Harrison, London. From The Vellamoid Paper Co., Worcester, W. Va., U.S.A. Eng. Pat. 19,541, Sept. 10, 1903.

SEE U.S. Pat. 740,006 of 1903; this J., 1903, 1145.—T. F. B.

UNITED STATES PATENTS.

Paper Stuff Water Circulating Apparatus for Paper Mills. R. Dietrich, Mühlberg, Germany. U.S. Pat. 767,210, Aug. 9, 1904.

SEE Eng. Pat. 4378 of 1903; this J., 1904, 382.—T. F. B.

Cellulose; Production of Amorphous —. I. Kitsee, Philadelphia. U.S. Pat. 767,822, Aug. 16, 1904.

AMORPHOUS cellulose is produced "by applying an oil or fatty substance to a portion of the surface of a fibrous material, and then subjecting the material to nitration, whereby only the parts which are not protected with the oily substance are nitrated."—T. F. B.

Nitrated Cellulose; Process of Dissolving —. I. Kitsee, Philadelphia. U.S. Pat. 767,943 and 767,944, Aug. 16, 1904.

MOIST nitrated cellulose is dissolved by treating with a suitable solvent, such as acetic acid fumes. According to the second specification, "cellulose in previous nitrated condition" is subjected to the fumes of a suitable solvent.

—T. F. B.

Celluloid [Utilising Waste —]. I. Kitsee, Philadelphia. U.S. Pat. 767,646, Aug. 16, 1904.

WASTE pieces of celluloid are subjected, in wire baskets enclosed in a suitable vessel, to the action of the vapour of a solvent until they are sufficiently plastic to be worked up again. The vapours of the solvent are then drawn off to a cooled condenser.—T. F. B.

Viscose; Apparatus for Extracting Air and Carbon Bisulphide contained in —. L. Naudin, Assignor to La Soc. Franç. de la Viscose, Paris. U.S. Pat. 767,421, Aug. 16, 1904.

SEE Fr. Pat. 340,690 of 1904; this J., 1904, 834.—T. F. B.

FRENCH PATENTS.

Gypsum for Loading Paper; Manufacture of Crystallised —. W. Brothers. Fr. Pat. 340,952, March 4, 1904.

NATURAL or artificial calcium sulphate is heated in water or in an aqueous solution to a temperature of from 80° to 130° C. under pressure, the mixture being agitated during cooling to allow of the formation of separate and complete crystals, which are afterwards taken out and dried.

—W. C. H.

Celluloid; Process for Making Products Resembling —. Chem. Fabr. vorm. Weiler-ter Meer. Fr. Pat. 341,556, March 23, 1904.

INSTEAD of using camphor in the manufacture of celluloid, the following classes of compounds may be employed:—Mono- or poly-halogen derivatives of primary aromatic amino compounds; acyl derivatives of halogenised aromatic amines (e.g., chloroacetanilide); acyl (formyl-, acetyl-, benzoyl-) derivatives of secondary aromatic amines such as methylaniline or alkylnaphthylamines.—T. F. B.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Veronal [Diethylmalonylurea]. B. Molle and Kleist. Arch. Pharm., 1904, 242, 401—406.

VERONAL, prepared by the condensation of urea and diethylmalonic ester, forms a white crystalline powder of bitter taste, melting at 191° C., and dissolving in 145 parts of water at 20° C., in 12 parts at 100° C. It dissolves readily in ether, acetone, acetic ester, or amyl alcohol, less readily in cold alcohol, chloroform, carbon tetrachloride, acetic acid, ligroin, or amyl alcohol, still less in petroleum spirit or aniline, and very slightly in warm benzene. It also dissolves, apparently unaltered, in concentrated sulphuric acid, and in cold alkali hydroxide or carbonate solutions. When these alkaline solutions are heated for some time, or when the dry substance is fused with sodium hydroxide, ammonia, carbon dioxide, and diethylacetic acid are formed: $-(C_2H_5)_2C(CO.NH)_2CO + 5 NaOH = (C_2H_5)_2CH.COONa + 2Na_2CO_3 + 2NH_3$; no doubt sodium diethylmalonate is formed intermediately. A characteristic reaction of veronal was discovered, as follows:—To 1—2 c.c. of the solution, as nearly saturated as possible, add two drops of nitric acid, then Millon's reagent drop by drop; a white gelatinous precipitate falls. Excess of the reagent must be avoided, as it dissolves the precipitate. From the precipitate the veronal can be recovered in the pure state. This, together with Denigé's reaction with mercuric sulphate, with the determination of the melting-point, and with the appearance of the crystalline needles of the sublimate of the substance, afford satisfactory criteria for identifying veronal. Veronal, when taken into the system, is excreted unaltered in the urine.—J. T. D.

Euporphine [Apomorphine Bromomethylate]. Bergell and Pechorr. Apoth. Zeit., 1904, 423. J. Pharm. Chim., 1904, 20, 173—174.

EUPORPHINE, and other quaternary ammonium compounds derived from apomorphine, have, like apomorphine, powerful emetic action, showing that this is not due to the presence of a tertiary amino-group, but to the two phenolic hydroxyl groups, since the dialkyl ethers of apomorphine exhibit no such action.—T. F. B.

Alkaloid Content of Cultivated Cinchonas. O. Hesse. Apoth. Zeit., 1904, 19, 315. J. Pharm. Chim., 1904, 20, 160.

THE subjoined table shows the mean results obtained by the analysis of certain specimens of cinchona.

Variety.	Total Alkaloids.	Quinine Sulphate.
	Per Cent.	Per Cent.
Cinchona pahudiana.....	0.7	0.2
" calisaya v. jap.	3.7	1.05
" hasskarliana	3.4	1.45
" lancifolia	3.9	0.9
" coloptera	3.6	0.5
" officialis	4.8	4.7
" succirubra	8.1	2.45
" calisaya ledgeriana ..	8.0	8.8
Hybrid of succirubra and ledgeriana.	8.0	5.2

It appears that the most suitable for cultivation are *officialis*, *succirubra*, and *calisaya ledgeriana*; in Java the latter is largely cultivated, as also are its hybrids with *succirubra*.—T. F. B.

Essential Oil of Rose [Otto of Rose]; Analytical Characters of —. P. Jeancard and C. Satie. Bull. Soc. Chim., 1904, 31, 934.

Essential Oil of the non-petaloid parts of Rose Flowers.—1000 kilos of the calices, stamens and pistils, or the rose flowers deprived of petals, gave 50 grms. of a green essential oil with the following characters:—Solidifying point, + 8° C.; steareptene, 51.13 per cent.; sp. gr. at 15° C., 0.8704; as at 15° C., - 41°; acid value 6.12; saponification

value, 22.4; total alcohols, 18.99 per cent.; citronellol, 13.56 per cent. The bulk of the stearoptene is composed of a 1st having the m. pt. 14° C. The high lævo-rotation of the oil indicates that practically all the alcohol present is citronellol.

Essential Oil of Entire Rose Flowers grown at Cannes.—The oil obtained by cohabitation and distillation of the entire roses of the Cannes district had the following characters:—Solidifying point, 25.5° C.; stearoptene, 33.20 per cent. The oil freed from stearoptene had the sp. gr. 0.8790 at 150° C.; n_D^{20} = 1.463 at 15° C.; solubility in 70 per cent. alcohol, 1:2; total alcohols, 38.56 per cent.; citronellol, 22.40 per cent. By merely distilling, without cohabitation, so as to obtain a weight of distillate [rose-water] equal to that of the flowers, only a very small yield of essential oil was obtained. This had the following characters:—Solidifying point, 26.9° C.; stearoptene, 56.88 per cent.; acid value, 1.2; saponification value, 14.7; total alcohols, 38 per cent.

Essential Oil of Tea Rose distilled at Cannes had a distinctive odour; it contained 72–74 per cent. of stearoptene, although it congealed as high as 23.5° C. This stearoptene consists of two bodies, one solidifying at 14° C. the other at 40° C. In this it resembles the stearoptene of the oil from the nonpetaloid portions of the flower. These results indicate the fallacy of the application of the solidification test to the valuation of otto of rose. The amount of stearoptene should be determined gravimetrically and the percentage of citronellol determined after its removal.

Determination of Stearoptene.—10 grms. of the oil are treated with 50 c.c. of acetone, and cooled, without stirring, to –10° C. The separated stearoptene is collected on a tared filter surrounded by freezing mixture, washed with cooled acetone, dried *in vacuo* over sulphuric acid and weighed. The acetone is distilled off from the filtrate *in vacuo* and the residue employed for the determination of the citronellol.

Bulgarian Rose Oil of good quality shows but little variation from the following characters:—Solidifying point, 19–21° C.; stearoptene, 18–23 per cent. The oil, deprived of stearoptene, has the sp. gr. 0.886–0.888 at 15° C.; n_D^{20} from 1.46 to 1.48; solubility in 70 per cent. alcohol, 1:1.5; acid value, 1–2; saponification value, 10–12; total alcohols, 34–38 per cent.; citronellol, 30–40 per cent.

Standards.—Provence rose oil should contain from 30 to 35 per cent. of stearoptene and from 26–23 per cent. of citronellol in the oil freed from stearoptene; whilst for Bulgarian otto the figures should be 18–23 and 30–40 respectively.—J. O. B.

Lemon Oil; Adulteration of.—E. Berté. *Boll. Chim. Farm.*, 1904, 43, 349–357. *Chem. Centr.*, 1904, 2, 358–359.

As an addition to an earlier paper on the analysis of lemon oil (see Soldiani and Berté, this J., 1897, 266), the author gives the results of analyses of oils of the years 1898–1902 (inclusive). In 1898 and 1899, adulteration was limited to the addition of French turpentine, but since that time, adulteration with American turpentine, limonene, stearoptene—easily recognised by the dark colour of the residue—and, in one case, with turpentine resin has been detected. Contrary to the opinion of Child and Burgess (this J., 1901, 1176) the author states that the nature of the adulterant can be ascertained by chemical examination of the fractionated distillate, and comparison of the refractive indices of the different fractions, and of the residue, with the refractive index of the original oil. In presence of small quantities of American or French turpentine or limonene, the optical rotation of the residue and of the distillate was the same or somewhat lower than that of the original oil.

—A. S.

ENGLISH PATENT.

Tobacco and its By-products; Process and Apparatus for Treating.—E. Turpin, Pontoise, France. *Eng. Pat.* 16,613, July 28, 1903.

TOBACCO is freed from nicotine by moistening it with ammonia or other alkali, and then extracting with a

suitable solvent, e.g., water, alcohols, ethers, carbon disulphide, benzene, &c. The solvent is recovered by distillation, and the nicotine is precipitated from the extract by means of salicylic or phthalic acid or picric acid or other nitrophenols. The tobacco thus freed from nicotine may be treated with aromatic perfumes, &c., as substitutes for the nicotine. Several modifications of apparatus for carrying out the extraction of the nicotine are claimed, as also the use of nitrophenols (especially picric acid) and salicylic and phthalic acids as reagents for the detection of nicotine, for the purpose of controlling the process.—A. S.

UNITED STATES PATENTS.

Odoriferous Compound; Process of Making.—E. Knoevenagel, Heidelberg. U.S. Pat. 767,291, Aug. 9, 1904.

SEE *Fr. Pat.* 335,380 of 1903; this J., 1904, 204.—T. F. B.

Xanthine Derivative [Theobromine Carboxylic Acid], and Process of Making same.—M. C. Massie, Washington, Administrator of F. Ach, Assignor to C. F. Boehringer und Soehne, Mannheim-Waldhof, Germany. U.S. Pat. 767,352, Aug. 9, 1904.

8-TRICHLOROMETHYLTHEOBROMINE is converted into theobromine-8-carboxylic ester by heating with alcohol. The ester is saponified by means of alkali, and the alkali salt precipitated by acidifying the solution. The salt is then filtered off, and its aqueous solution is decomposed by addition of acid. Theobromine-8-carboxylic acid is thus obtained in the form of small white needle-shaped crystals, of m. pt. 345° C., sparingly soluble in water, and almost insoluble in alcohol, chloroform, or acetic ester.—T. F. B.

Xanthine; Art of Making.—M. C. Massie, Washington, D.C., Administrator to F. Ach, Assignor to C. F. Boehringer und Soehne, Mannheim-Waldhof, Germany. U.S. Pat. 767,353, 767,354, and 767,355, Aug. 9, 1904.

SEE *Fr. Pat.* 326,267 of 1902; this J., 1903, 819.—T. F. B.

FRENCH PATENT.

Camphor from Isoborneol; Process for Preparing.—Chem. Fabr. auf Actien, vorm. E. Schering. *Fr. Pat.* 341,513, March 21, 1904.

ISOBORNEOL is converted into camphor to the extent of 95 to 100 per cent. by oxidation with a neutral solution of a permanganate. 1 kilo. of isoborneol, powdered, or dissolved in 1 kilo. of benzene, is agitated with a solution of 1 kilo. of potassium permanganate in 100 litres of water until the solution is colourless; pure camphor is obtained by distilling the product in steam, and crystallising the crude camphor from any suitable solvent.—T. F. B.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Sensitisers; Supplementary.—A. Miethe. *Z. Wiss. Phot. Brit. J. Phot.*, 1904, 51, 708–709.

THE Eosines, Quinoline Red, and a few other dyestuffs, which do not by themselves increase the colour sensitiveness of emulsions, have considerable value as auxiliary sensitisers when used in conjunction with the cyanines or isocyanines. For instance, a plate stained with Methyl Red nitrate (nitrate of the isocyanine from quinoline methyl iodide and quinaldine methyl iodide) always exhibits a certain amount of fog, whereas, if Quinoline Red be added to the staining bath (e.g., 1 part of Methyl Red nitrate and 4 parts of Quinoline Red) the plates obtained are of good colour and sensitiveness, free from fog, and keep well, whilst the curve of colour sensitiveness will be remarkably even, the separate maxima being much less pronounced. Ethyl Red nitrate may be substituted for Methyl Red nitrate with equally good results. The use of certain other cyanines which give great sensitiveness for red (e.g., ethyl cyanine) is also rendered possible by addition of Quinoline Red, the plates obtained exhibiting perfect freedom from fog and good general sensitiveness.—T. F. B.

Cyanine Dyestuffs; Constitution of —. A. Miethe and G. Book. IV., page 862.

ENGLISH PATENT.

Centrifugal Spreader [Photographic Films]; Improved —. A. W. Penrose, London. From G. W. Hinton, St. Joseph, Mo., U.S.A. Eng. Pat. 14,498, June 27, 1904.

THE spreader, which is used for spreading the sensitive film on metal plates for photo-etching processes, consists of an inverted cone in which the plate is placed. Means are provided for rotating the cone, for supplying air heated by a lamp held in position below the apparatus, and for preventing the access of actinic light, and dust to the interior of the cone. There is also a suitable brake and means for collecting the excess of emulsion.—W. H. C.

UNITED STATES PATENT.

Photographic Developer [Glycocol]. B. Homolka, Frankfurt, and N. Schwan, Soden, Assignor to Farbwerke vorm. Meister, Lucius and Brüning, Hoechst-on-the-Maine. U.S. Pat. 767,815, Aug. 15, 1904.

SEE Eng. Pat. 20,377 of 1902; this J., 1903, 380.—T. F. B.

FRENCH PATENT.

Photographs having the Appearance of Engravings or Sepia Prints; Process for Producing —. Van Meurs et Cie. Fr. Pat. 340,974, March 5, 1904.

PHOTOGRAPHS resembling black or sepia engravings are obtained by toning the ordinary gelatino-chloride paper, with a bath containing platinum or gold, to the desired tone, fixing in the usual manner, and then again toning in a solution which tints the high lights yellowish or pale brown; this latter bath may consist of a solution of a platinum salt with sodium thiosulphate, and may be prepared by adding platinum sulphate to a solution of sodium thiosulphate, boiling, and filtering. Other methods of preparing the bath are also claimed.—T. F. B.

XXII.—EXPLOSIVES, MATCHES, Etc.

Copper; Physical Properties of —. [Crusher Gauges for Recording Powder Pressures.] P. Galy-Aché. X., page 868.

— ENGLISH PATENTS.

Guncotton Blocks; Pressing of —, and Apparatus therefor. G. W. Bell, Ipswich. Eng. Pat. 17,414, Aug. 11, 1903.

SEE Fr. Pat. 340,473 of 1904; this J., 1904, 887.—T. F. B.

Guncotton; Method of and Apparatus for the Formation of Blocks of —. G. W. Bell, Ipswich. Eng. Pat. 17,415, Aug. 11, 1903.

GUNCOTTON pulp, composed preferably of one part of nitrocellulose to 10 or 15 parts of water, is introduced into an exhausted chamber which is connected with a vacuum pump. When the block so formed is practically free from air, water is introduced into the chamber, and the block is compressed from each end by means of pistons. A suitable apparatus consists of a mould with perforated walls, fixed in a vertical airtight cylindrical chamber, the lower end of which is connected with a vacuum pump. Pistons are provided in each end of the chamber, working snugly in the mould, and the guncotton pulp is introduced into the upper end of the mould from a receptacle provided with stirrers and a gauge-glass. This receptacle is preferably adapted to be made airtight, if necessary, so as to enable pressure to be applied to force the pulp into the mould. A distributor, for distributing the pulp evenly in the mould, is also described.—T. F. B.

Nitroglycerin; Manufacture of —. R. Möller, Hamburg. Eng. Pat. 13,562, June 15, 1904.

THE separation of the crude nitroglycerin from the nitrated mass is facilitated by adding to the acid mixture or to the glycerin, before nitration, a small quantity of a fatty hydro-

carbon or acid, or ester of the latter, or a compound of the aromatic series which is not decomposed by the acids present. For example, 0.5 to 2 parts of paraffin oil is mixed with the acid necessary for the nitration of 1000 parts of glycerin.—T. F. B.

FRENCH PATENT.

Explosives of the Ammonium Nitrate Group; Process for Manufacturing —. J. Führer. Fr. Pat. 341,633, March 7, 1904. Under Internat. Conv., Feb. 19, 1904.

THIS process is applicable to all explosives containing ammonium nitrate mixed with other compounds, the points of fusion of which are lower than the decomposition point of ammonium nitrate. The materials are intimately mixed and compressed into cylinders by a pressure of 1000 to 5000 kilos. per sq. cm. The cylinders are then immersed in a bath of liquid at a temperature somewhat lower than the melting point of the fusible constituents of the mixture, until the temperature of the whole mass is uniform, when they are transferred to a bath consisting of the same constituents in a molten state. The cylinders are now dried and placed in a current of cold air. This treatment has the effect of producing a more or less porous mixture of high detonating power and in a compressed state.—T. F. B.

XXIII.—ANALYTICAL CHEMISTRY.

APPARATUS, ETC.

ENGLISH PATENT.

Butyrometers; Impts. in —. E. E. O. Roewer, Stützerbach, Germany. Eng. Pat. 20,630, Sept. 25, 1903.

THE instrument consists of an ordinary shaped (Gerber) tube, having the graduated part of the neck flattened instead of round.—W. P. S.

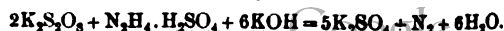
INORGANIC—QUANTITATIVE.

Potassium; Determination of —. N. Tarugi. Gaz. chim. ital., 1903, 34, 324—341. Chem. Centr., 1904, 2, 866.

AFTER destroying any organic matter present, the salt (about 1 gm.) is treated with concentrated sulphuric acid, and then ignited in order to remove hydrochloric and sulphuric acids and ammonium salts. It is then dissolved in a definite volume of water, and 10 c.c. of the solution are treated with 10 c.c. of a 15 per cent. solution of sodium persulphate of known purity. (The persulphate content of the sodium salt is determined by titrating hot with N/10 sodium hydroxide solution, and the acidity by titrating in the cold; see this J., 1903, 493.) The mixture is agitated for three hours, at 0° C. in the case of dilute solutions, and the separation of the potassium persulphate is induced by introducing a small crystal of the salt. The unused persulphate in a known volume of the solution is then determined by titration with N/10 sodium hydroxide solution. The author finds that the solubility of potassium persulphate in water at temperatures from 0° to 40° C. is not influenced by the addition of sodium, calcium, and magnesium sulphates, di- and tri-sodium phosphate and sodium persulphate. The solubility of potassium persulphate expressed in percentages is: From 0° to 9° C. (0.0376) $t + 0.564$; 9°—10° C. (0.00278) $t + 0.8773$; 10°—15° C. (0.0376) $t + 0.529$; and 15°—40° C. (0.094) $t + 0.3164$. That potassium persulphate gives four distinct solubility curves is considered to be due to the formation of hydrates. Test analyses carried out by the above method gave at 21° C. instead of 4.32 per cent., 4.34, 4.31, and 4.28 per cent. of potassium oxide; and at 0° C. instead of 1.35 per cent., 1.36, 1.35, and 1.36 per cent. of potassium oxide.—A. S.

Persulphates; Quantitative Determination of —. E. Pan-nain. Gaz. chim. ital., 1904, 34, 500—504. Chem. Centr., 1904, 2, 563.

HYDRAZINE set free from its salts by means of concentrated potassium hydroxide solution, reacts vigorously with persulphates, according to the equation —



The determination of persulphates by this method can be carried out in a Lunge's nitrometer, solutions of the persulphate and of a hydrazine salt being placed in the outer vessel, and concentrated potassium hydroxide solution in the inner one.—A. S.

Sulphur, Commercial; Valuation of — [by Means of Aniline]. J. Ceruti. Boll. chim. farm., 1904, 421; Rép. de Pharm., 1904, 16, 361.

ANILINE, b.p. 180° — 185° C., is used as the solvent to extract sulphur from the crude commercial product. From 1 to 2 grms. of the sample are extracted on a tared filter with 50 c.c. of aniline heated to 120° — 130° C. The filter is then washed with alcohol, dried, and weighed. The filtrate may be neutralised with hydrochloric acid and cooled, when the pure sulphur is precipitated; this may be collected, washed, dried over sulphuric acid, and weighed.—J. O. B.

Water in Molasses; Determination of — G. Testoni. Staz. sperim. agrar. ital., 37, 366—369. Chem. Centr., 1904, 2, 562—563.

Fifty grms. of the molasses are distilled with 200 c.c. of turpentine, which has been previously saturated with water. Distillation begins at 90° — 95° C., and the temperature then gradually rises to 155° — 160° C. Towards the end of the distillation, the condenser should be gently warmed, to drive over any small quantity of water therein. The distillate is collected in a graduated vessel, and the volume of the layer of water read off. The author states that this method gives more accurate results than the usual one of drying for 7—8 hours at 105° — 110° C.—A. S.

Copper Sulphate; Method for Determining the Purity of — for Use in the Vineyard. C. Montanari. Staz. sperim. agrar. ital., 1904, 37, 227—230. Chem. Centr., 1904, 2, 367.

THE author proposes the following modification of Zecchini's method (this J., 1899, 710), by which the use of an unstable solution of iodine is avoided. 50 c.c. of a solution containing 19.878 grms. of pure crystallised sodium thiosulphate, 8 grms. of ammonium thiocyanate, and 0.5 gm. of potassium iodide are treated with 5 c.c. of a freshly prepared starch solution (1 gm. per 100 c.c.), and a solution of the sample of copper sulphate under examination (20 grms. per litre) is run in slowly from a burette, until a faint blue coloration appears. The amount of copper contained in the volume required to produce the blue colour is equivalent to 1 gm. of crystallised copper sulphate ($\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$). —A. S.

Boric Acid; Determination of — in Cider, Fruits, &c. A. H. Allen and A. R. Tankard. Brit. Pharm. Conf., 1904. Pharm. J., 1904, 73, 242—244.

Boric acid is, in traces, a normal constituent of apples, and is therefore present also in cider. Apples were found to contain from 0.009 to 0.013 per cent., and cider from 0.004 to 0.017 gm. per 100 c.c., the lower amount being found in the Devonshire variety, the higher in the Herefordshire product. Boric acid was also found in grapes—0.004 per cent.; in pomegranates, 0.005 per cent.; in quinces, 0.016 per cent.; and in pears, 0.007—0.016 per cent. The presence of phosphates in apples and apple juice renders the general processes for the determination of boric acid therein inapplicable. The following methods have been found both accurate and expeditious for the purpose.

Extraction Method.—About 100 c.c. of cider or other liquid are evaporated to dryness with a few c.c. of a 10 per cent. solution of calcium chloride. In the case of fruits about 50 grms. are cut up into small pieces, and the solution of calcium chloride poured over the mass, which is then evaporated to dryness. The dry residue is well charred, boiled with about 150 c.c. of distilled water, and filtered. The carbonaceous residue is then thoroughly incinerated at a moderate temperature, and the resulting ash boiled with another 150 c.c. of water, and allowed to stand, when cold, for some hours, or, preferably, over-night. A third treatment with water, and subsequent standing, may be necessary to extract the whole of the borate. The collective aqueous extracts are filtered and evaporated to 25—30 c.c.

After cooling, the concentrated liquid is neutralised with N/10 acid with Methyl Orange as indicator, care being taken that all the borate is in solution before the titration is begun. An equal volume of glycerol (rendered neutral to phenolphthalein just before use) is next added, and the mixture titrated with N/20 sodium hydroxide solution with phenolphthalein as indicator. At the end of the titration another 10 c.c. of glycerol should be added, when the red colour should be permanent. Each c.c. of the N/20 sodium hydroxide solution is equivalent to 0.00175 gm. of boric anhydride, B_2O_3 , or 0.0031 gm. of boric acid, H_3BO_3 .

Distillation Method.—A suitable quantity of the substance under examination is treated with calcium chloride as described above, well charred, and the main portion of the salts extracted with about 50 c.c. of water. This aqueous extract is transferred to a 100 c.c. distillation flask and evaporated nearly to dryness. Meanwhile the charred residue is incinerated, the ash moistened with 2 c.c. of strong sulphuric acid and warmed. When the evolution of gaseous hydrochloric acid is nearly complete, the acid liquid is transferred to the distilling flask, the last portion being washed in with 10 c.c. of methyl alcohol (ordinary wood spirit of good quality, distilled over caustic potash, is suitable for the purpose). The liquid is distilled nearly to dryness. Another 10 c.c. of methyl alcohol are then introduced, and distilled off. As many as six such treatments are usually requisite, the contents of the flask being allowed to cool between each addition of methyl alcohol. A portion of the residue in the flask should then be tested by the dame test for boric acid. If a reaction be obtained, further distillations must be performed. The alcoholic vapours are passed into 25 c.c. of water, the end of the distillation tube dipping into the liquid in the receiver. The distillate is evaporated on the water-bath until free from alcohol, the methyl borate is then hydrolysed and boric acid liberated. The liquid is rendered neutral to Methyl Orange, then treated with glycerol and titrated with N/20 sodium hydroxide solution as described above.

—J. O. B.

Manganese in Drinking Water; Determination of — G. Baumert and P. Holdefeiss. Z. Untersueb. Nahr. Genussm., 1904, 8, 177—181.

THE following method is given for the determination of the small quantities of manganese occurring in some well waters (this J., 1904, 556). From 250 c.c. to 1000 c.c. of the water are acidulated with 1 c.c. of hydrochloric acid and evaporated to a volume of 100 c.c. Towards the end, a little zinc oxide or barium carbonate may be added to precipitate the iron. The solution is filtered and the filtrate collected in a stoppered flask. 5 c.c. of a 10 per cent. sodium hydroxide solution are added and the contents of the flask well shaken for five minutes, the stopper being raised from time to time to admit air. After this, 5 c.c. of a 10 per cent. potassium iodide solution are added and then hydrochloric acid drop by drop until the brown precipitate dissolves. Starch solution is now added and the liberated iodine titrated with sodium thiosulphate solution (0.30 gm. per litre). The latter is standardised on a solution of pure manganous chloride (about 10 mgrms. per litre). The authors also employed Knorre's method (this J., 1903, 1104) in so far that they precipitated the manganese from some of the samples of water with persulphate, and then applied the above method to the precipitate. Evaporation of a large volume of water was thus avoided (see also this J., 1903, 926).—W. P. S.

ORGANIC—QUALITATIVE.

Hexoses; Reactions of — B. Ofner. Monatsh. f. Chem., 1904, 25, 611—620.

THE author has made systematic investigations on the action of hydrochloric acid of various strengths on levulose, dextrose, cane sugar, mannose, maltose, galactose, lactose, isodulcitol and arabinose. He finds that Seliwanoff's reaction for detecting levulose in presence of dextrose and other aldoses must be modified as follows: A small quantity of the sugar, and a little resorcinol are dissolved in 3 or 4 c.c. of hydrochloric acid of 12 per cent. strength, and boiled for not longer than 20 seconds. When levulose is present, a deep

red coloration and turbidity immediately appear. If a sugar solution or urine is to be examined, concentrated hydrochloric acid is added to it until the solution contains 12 per cent. of acid, the heating being then carried out as before. No general rule exists for the action of secondary hydrazines on ketoses and aldoses, and in order to detect levulose in presence of dextrose in this way, methylphenylhydrazine must be employed as originally recommended by Neuberg.

—T. H. P.

Abrastol in Wine; Detection of — E. Gabutti. *Staz. sperim. agrar. ital.*, 1904, 37, 234—236. *Chem. Centr.*, 1904, 2, 870.

100 c.c. of the sample rendered alkaline by the addition of a few drops of ammonia in order to prevent extraction of the natural colouring matter of the wine, are shaken for some minutes with 10—15 c.c. of amyl alcohol. The alcoholic extract is filtered, evaporated to dryness in a small porcelain dish on the water-bath, the residue dissolved in concentrated phosphoric acid (sp. gr. 1.7), heated, treated with 1 or 2 drops of a concentrated solution of formaldehyde, again heated, and filtered. If *abrostol* be present, even in so small a quantity as 0.1 gm. per litre, the filtrate shows a green fluorescence. —A. S.

ORGANIC—QUANTITATIVE.

Methoxyl; Determination of — W. Kropatschek. *Monatsh. f. Chem.*, 1904, 25, 588—592.

In the determination of alkoxy groups it is advisable to employ hydriodic acid perfectly free from hydrogen phosphide. If this be done, it is immaterial whether Zeisel's process is used or any modification of it, such as that given by Gregor (this J., 1898, 609). The author recommends the following method, which avoids the use of phosphorus, for the preparation of hydriodic acid. Formic acid and iodine in the relation of I_2 to CH_2O are boiled together in a reflux apparatus, until the greater part of the iodine is used up. Between the boiling flask and the reflux condenser is placed an extraction apparatus provided with a cock (as in the figure), by which it is contrived that the iodine subliming away from the liquid shall be washed into the flask again by the condensed formic acid vapours. The hydriodic acid thus obtained, is distilled several times *in vacuo*.

—T. H. P.

Betaïne Periodide and the Determination of Betaïne. V. Stanek. *Z. Zuckerind. Böhmen*, 1904, 28, 578—583.

On adding a solution of iodine in potassium iodide to an aqueous solution of a betaïne salt, a brownish-red precipitate is formed which quickly changes to green crystals with metallic lustre similar to Magenta. If precipitation take place in a hot solution a green oil separates, which on cooling sets as a crystalline mass with a metallic lustre. Free betaïne is not precipitated by a neutral solution of iodine in potassium iodide, but only when acid is added. The tri-iodide is easily soluble in alcohol, hydriodic acid, and in an aqueous solution of potassium iodide. It fuses at 58° — 61° C. with disengagement of iodine. The compound is only slightly soluble in water, but on boiling in water it loses iodine, and betaïne hydriodide passes into solution. For the quantitative precipitation of betaïne the author uses a solution of potassium tri-iodide prepared by dissolving 100 grms. of potassium iodide and 153 grms. of iodine (free from iodine cyanide) in 200 c.c. of water. On dilution, iodine separates out from the solution. Sodium chloride or sulphuric acid lessen the solubility of betaïne tri-iodide. Acetic and lactic acids and the constituents of the ash of molasses are without influence on the precipitation, but urea and the substances contained in Liebig's extract of meat are partly precipitated also. An acidified

solution of diluted molasses gave a black somewhat crystalline precipitate containing 1.64 per cent. of nitrogen, 65 per cent. of this being due to betaïne. —L. J. de W.

Malt Analysis. A. R. Ling. *J. Inst. Brewing*, 1904, 10, 481—491. (See this J., 1902, 983; 1903, 677.)

In the determination of extract it is considered preferable to employ weighed quantities of water than to make up the wort to a definite volume, and to calculate the total volume by means of the formula: $V + v = \frac{100(500 + W - 1)}{G - 8}$.

In this formula, V represents the number of c.c. of solution from 10 grms. of wort; v the number of c.c. of water in the wort; W the number of grms. of moisture in 50 grms. of the malt; D the gravity of the wort; S the number of grms. of dissolved matter per 100 c.c. of wort; and G the weight of 100 c.c. of wort. The factor for multiplying the excess gravity of the wort, in order to obtain the yield of extract in lb. per barrel, may be calculated by the formula: $\frac{3.36(V + v)}{500}$. The fineness of the

grist influences the results obtained in malt analysis; and the author uses a coarse grist ground as uniformly as possible. For attaining this object, the Seck mill is considered advantageous. The mash temperature may vary slightly from the limit of 150° F., but should be kept constant owing to its influence on the character of the wort solids. Little definite is yet known of these, but useful statistical data may be obtained from the specific rotatory power and cupric-reducing power of the wort, calculating from these the percentage of apparent maltose and dextrin present. The rotatory power, however, varies with the nature of the malt, whilst the percentage of apparent maltose seems, in malts made on identical lines, to have a more definite ratio to the amount of extract present. —C. S.

Aldehydes in Wine, &c.; New Method for the Determination of — L. Mathieu. *Rev. intern. falsific.*, 1904, 17, 43—45. *Chem. Centr.*, 1904, 2, 480.

One gm. of tartaric acid and 20 c.c. of a solution containing sodium bisulphite equivalent to 30 mgrms. of sulphur dioxide are added to 100 c.c. of the wine, the mixture is shaken, and allowed to stand for four hours in the dark. A few c.c. of starch solution are added, followed by iodine solution till a distinct blue coloration is produced, and then immediately about 10 c.c. of sodium arsenite solution. The combined sulphur dioxide is finally determined by the Hass method. For wines containing more than 10 mgrms. of aldehydes per 100 c.c., relatively more sulphur dioxide is added, whilst of wines containing very small amounts of aldehyde, 200 c.c. are used for the determination. Some brandies contain more than 0.1 gm. of aldehydes per 100 c.c. In such cases, 100 c.c. of the sample are treated with 2 grms. of tartaric acid and about 400 mgrms. of sulphur dioxide in the form of a concentrated solution of sodium bisulphite, the flask containing the mixture is filled up with water, and the method described above followed.

—A. S.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Radio-active Lead, Radio-tellurium and Polonium. A. Debierne. *Comptes rend.*, 1904, 139, 281—283.

The author has re-investigated the radio-active substance obtained from pitchblende residues by precipitation with sulphuretted hydrogen in acid solution. A method is described by means of which a body 100,000 times more radio-active than uranium has been extracted. It agrees in properties with each of the three bodies already obtained from pitchblende by rather similar treatment, viz., polonium by the Curies, radio-lead by Hofmann and Strauss, and radio-tellurium by Marckwald (this J., 1903, 49, 657, and 1146). Like these it is sharply distinct from other radio-active substances in its radiation, which consists only of α -rays of feeble penetration and deviated with difficulty by a magnet. It gives no emanation and does not induce radio-activity. The fact that the radiations from these three bodies are identical, proves, in the author's opinion, that

there is only one radio-active substance precipitated from pitchblende by sulphuretted hydrogen in acid solution, and this should be called polonium by right of priority.—F. Sdn.

Lead Acetate and Thiosulphate; Crystallised Compound of—P. Lemoult. *Comptes rend.*, 1904, 139, 422—424.

If to a solution of sodium thiosulphate there be added solution of lead acetate, followed by acetic acid, or if the thiosulphate solution be added to lead acetate solution previously acidified with acetic acid, there is deposited, after a longer or shorter time, according to the concentrations of the solutions, a beautifully crystallised substance having the composition represented by $2\text{PbS}_2\text{O}_3 \cdot \text{Pb}(\text{C}_2\text{H}_3\text{O}_2)_2$. The substance is but slightly soluble in cold water, less so in water acidified with acetic acid; it is much more soluble in hot water, and is deposited again from the solution on cooling. Barium acetate behaves similarly to lead acetate in so far as in its presence acetic acid does not decompose sodium thiosulphate with separation of sulphur, but the solution does not, like the lead solution, deposit crystals.

—J. T. D.

Hydrogen Sulphide in Mineral Springs; Condition of—F. Auerbach. *Z. physik. Chem.*, 1904 49, 217—223.

The dissociation constant of hydrogen sulphide was found to be $0.91 \cdot 10^{-7}$. By means of the "avidity formula"—

$$\frac{[\text{HS}]}{[\text{HCO}_2]} = \frac{k_2}{k_0} \cdot \frac{[\text{H}_2\text{S}]}{[\text{H}_2\text{CO}_3]}$$

in which k_2 is the dissociation constant of hydrogen sulphide and k_0 that of carbonic acid, the relative amounts of free and combined hydrogen sulphide and carbonic acid in sulphur springs may be calculated. In mineral waters containing any considerable quantity of free carbonic acid, boric, silicic, and tannic acids will be present practically entirely in the free and undissociated condition, whilst the amount of carbonate ions (CO_3^{--}) will be negligible.—A. S.

p-Phenylenediamine; Oxidation-Products of—E. Erdmann. *Ber.*, 1904, 37, 2776—2780.

On oxidising *p*-phenylenediamine with potassium permanganate in aqueous solution, the main products are carbon dioxide and ammonia, but both hydrocyanic and oxalic acids are also formed. Under favourable conditions 2 per cent. of the theoretically possible amount of hydrocyanic acid can be obtained. In the animal organism, *p*-phenylenediamine is also oxidised with plentiful formation of ammonia. It is therefore possible that in this case also hydrocyanic acid is formed by a by-reaction, and contributes to the toxic effect.—E. K.

Dimethylpyroarsenic Acid. E. Baud. *Comptes rend.*, 1904, 139, 411—418.

WHEN monomethylarsenic acid is heated in an oil-bath at 130° — 140° C. in a stream of dry hydrogen, it loses water, and forms dimethylpyroarsenic acid, $2(\text{OH})_2\text{AsO} \cdot \text{CH}_3 = \text{H}_2\text{O} + (\text{OH})_2\text{As}_2\text{O}_3(\text{CH}_3)_2$. Monosodiummonomethylarsenate, when heated, and disodiummonomethylarsenate, heated at 140° C. in a stream of carbon dioxide, undergo corresponding transformations. In each case the product, when dissolved in water, regenerates the original substance. The new acid, when heated above 170° — 180° C., decomposes, forming arsenic trioxide and methyl alcohol.

—J. T. D.

FRENCH PATENT.

Ethers, Alcohols, Benzols, Collodion, &c.; Process for Rendering — Incombustible. J. P. Ducruet. *Fr. Pat.* 341,158, Feb. 28, 1904.

CARBON tetrachloride is added to inflammable liquids to reduce their combustibility; in the case of benzol, for instance, it is claimed that the addition of 25 to 30 per cent. of carbon tetrachloride renders it absolutely incombustible. Carbon tetrachloride is also claimed as a fire-extinguishing agent.—T. F. B.

New Book.

CARBORUNDUM (Monographien über angewandte Elektrochemie). Bd. XIII. Von FRANCIS A. J. FITZ-GERALD, Chemiker der Internat. Graphite Co., Niagara-Falls, N.Y. Ins Deutsche übertragen von Dr. MAX HUTH. Wilhelm Knapp's Verlag, Halle a. S. 1904. Price M. 2.

8vo volume, in style of pamphlet, containing 42 pages of subject-matter with nine illustrations and three tables. There then follows a bibliography, and index of authors. The leading subjects treated of are as follows:—I. Historical chapter, with description of the researches of Despretz, Marsden, Cowles, Schützenberger, Moissan, and Acheson. II. Carborandum Farnace by Acheson. III. Purification, Properties, and Analysis of Carborandum. IV. Applications of Carborandum. V. Simultaneous Preparation of Zinc and Carborandum. VI. Production of Carborandum.

Trade Report.

I.—GENERAL.

GOVERNMENT LABORATORY. REPORT OF THE PRINCIPAL CHEMIST FOR THE YEAR ENDED 31ST MARCH, 1904, WITH APPENDICES.

[Cd. 2,144.] Price 3d.

The work of the Government Laboratory during the financial year 1903—4, involved 59,986 tests in the Customs Laboratory, as compared with 61,442 in the preceding year, of samples of goods in regard to their liability to spirit duty, the sugar and tobacco duties, &c., and 85,805 analyses (against 88,370) in the Excise Branch of the Laboratory for the Inland Revenue and other Government Departments. 918 samples of flavouring essences, essential oils, and perfumery were tested during the year for liability to spirit duty. In addition, a large number of samples were examined of preparations such as chloroform, acetic ether, and ethyl bromide, in the manufacture of which spirit is used. A quantity of pure alcohol, equivalent to 2,272 proof gallons, was issued duty-free, with the sanction of the Treasury, to schools and colleges for research purposes, whilst the quantity of duty-free spirit issued to manufacturers under the Finance Act, 1902, was equivalent to 206,451 proof gallons. The majority of applications for permission to take advantage of this concession are said to have been made in cases in which the use of ordinary methylated spirit could not be regarded as unsuitable or detrimental; and in several cases the applicants seemed to be quite unaware that it was possible to obtain permission to use duty-free spirit in the form of methylated spirit in their manufacturing operations. In connection with the same subject there have also been examined a number of samples of denaturing agents—camphor, toluene, benzene, petroleum ether, nitrotoluene, nitrobenzene, animal oil, pyridine bases, &c.—and also samples of the denatured spirit before use, and after recovery by distillation. 160 samples of spirit entered as methyl alcohol, or wood oil, were examined, and of these eleven were found to be pure methyl alcohol and fifteen denatured ethyl alcohol. These were accordingly charged with duty, being potable. A note is given that among the imports were many instances of goods described as "extract of malt." This liquid, in these cases, having the density, alcoholic strength, and general character of ordinary beer, was charged the usual beer duty.

The exportation of medicinal tinctures, flavouring essences, and perfumes on drawback shows a continuous increase. In the past year 13,371 samples, representing 121,137 galls., of proof spirit have been examined, as compared with 12,878 and 118,557 galls. in the previous year. "The regulations in connection with the export of these preparations work very satisfactorily, and inaccuracies found in the traders' declarations are less frequent than

formerly." The quantity of wood naphtha approved in the year ending March 31, 1904, is slightly less than in the previous year; this does not, however, involve any real reduction in the use of spirit in manufacturing operations. During the last two years a number of manufacturers have erected apparatus for recovering the methylated spirit formerly wasted in their manufacturing operations, and in this way a large proportion of this spirit is used again instead of being allowed to escape into the air.

In regard to the sampling of saccharin-containing articles, Dr. Thorpe called the attention of the Board of Customs to the importation of chemicals related to saccharin, and requiring only very simple treatment for conversion into this compound, and it was decided that such substances are liable to saccharin duty. Goods suspected to be of this nature, as *o*-toluene-sulphonamide, are now sampled and sent for test to decide this point.

Arsenic was found in 84 out of 1,218 samples of beer in a sufficient quantity to render it necessary to notify the brewers that their materials were contaminated. Herb-beers were examined for alcohol in excess of 2 per cent. Of 852 samples, 269 contained excess of spirit, the amount ranging up 9.1 per cent.

There is a note on rosin size used at a paper mill, which, being discharged into a trout stream, killed a number of fish by blocking up the gills. A dilute solution of copper sulphate, used at Kew as a parasiticide for cucumbers and tomatoes, was found to answer well and not to affect the fruit injuriously. No trace of copper could be detected in either the cucumbers or tomatoes.

RUSSIA; FOREIGN TRADE OF — IN 1903.

Foreign Office Annual Series, No. 3253.

The first of the subjoined tables shows the quantity and value of certain articles exported from Russia during the years 1902-3, whilst the second gives details of some of Russia's exports to the United Kingdom:—

Exports from European Russia during the Year 1903, as compared with 1902.

Articles.	1902.		1903.	
	Quantity.	Value.	Quantity.	Value.
Linseed..... Tons	99,645	1,031,239	94,435	875,500
Hemp seed	17,748	300,600	15,532	116,025
Rape seed	31,890	196,893	59,725	317,900
Sunflower and poppy seeds....	19,748	300,812	14,193	127,181
Other seeds.....	2,181	25,181	2,500	23,800
Oil-cake	379,516	1,819,213	456,774	2,064,618
Hides, raw	15,726	843,731	14,290	1,149,879
Bones and bone-meal.....	27,858	139,518	29,000	132,706
Tallow.....	240	36,656	677	24,863
Naphtha and products.....	1,477,838	4,431,787	1,796,726	5,465,793
Tar and pitch.....	18,111	82,081	21,774	122,081
Manganese ore...	443,532	642,913	451,677	618,906
Sugar.....	69,119	690,305	176,387	1,539,243
Spirits..... Galls.	1,445,861	110,398	1,971,000	79,900

Statement of Certain Articles Exported from Russia to the United Kingdom during the Year 1903, as compared with 1902.

Articles.	1902.		1903.	
	Quantity.	Value.	Quantity.	Value.
Sugar, raw..... Tons	1,016	10,200	4,580	37,231
Linseed	38,836	398,904	45,800	428,187
Rape seed	14,000	90,000	27,032	123,200
Oil-cake	30,032	183,706	27,371	159,906
Hides and skins ..	1,548	85,212	1,193	91,693
Manganese ore...	133,806	192,418	106,323	148,006
Platinum..... Lb.	1,193	97,537	936	34,108
Naphtha and products..... Tons	385,016	777,962	526,274	1,387,200

NORWAY; TRADE OF — IN 1903.

Foreign Office Annual Series, No. 3252.

The following tables show the quantity and value of imports and exports into and from Norway during the years 1902-3:—

Imports.

Articles.	Quantity.		Value.	
	1902.	1903.	1902.	1903.
Malt..... Tons.	3,773	3,399	45,253	44,390
Sugar..... "	37,553	37,836	402,465	420,213
Brandy and spirits	1,336	1,214	119,120	119,423
Wine in barrels ..	4,726	4,006	234,000	196,333
Petroleum and paraffin.....	44,744	58,888	196,892	190,747
Salt..... Bahls.	4,017,368	5,064,324	107,343	96,589
Coal, cinders, coke	55,921,660	57,030,570	1,329,664	1,482,631

Exports.

Articles.	Quantity.		Value.	
	1902.	1903.	1902.	1903.
Fish oil..... Bahls.	331,172	214,533	379,422	271,376
" guano..... Tons.	6,676	6,596	42,233	41,600
Wood-pulp, dry ..	18,347	19,862	79,818	71,573
" wet	342,318	335,071	649,603	561,630
Cellulose, dry.....	100,484	117,454	734,746	780,306
" wet	13,712	19,445	45,253	59,554
Matches.....	3,029	2,533	61,686	57,667
Fyrates.....	106,979	115,148	81,611	91,441
Copper ore.....	4,847	5,447	12,407	9,747
Condensed milk ..	9,690	10,241	342,106	390,549
Packing paper.....	21,621	27,382	204,048	271,111
Worked granite and Labrador ..	144,283	165,279	134,917	150,006

III.—TAR PRODUCTS, PETROLEUM, Etc.

PETROLEUM PRODUCTS; COUNTERVAILING DUTY ON —. U.S. CUSTOMS DECISION, AUG. 1904.

Bd. of Trade J., Aug. 25, 1904.

Petroleum is on the "free list" of the United States Tariff, but its free admission is subject to the proviso that the crude article itself and all petroleum products produced in a country which imposes a duty on like articles exported from the United States are to be subject to a duty equal to the duty imposed by such country. It has now been decided that, for the purposes of this proviso, petroleum products manufactured in one country from crude petroleum produced in another country are to be assessed with duty at the rate imposed by the country of origin of the crude petroleum upon *similar products* imported into that country from the United States, and not at the rate levied upon crude petroleum imported into such country from the United States.

X.—METALLURGY.

LEAD; BOUNTIES ON — IN CANADA.

Bd. of Trade J., Aug. 25, 1904.

The present Act amends the previous Act (No. 31 of 1903) providing for the payment of bounties on lead contained in lead-bearing ores mined in Canada, in so far as it relates to section 5, which reads as follows:—

"5. The said bounties shall cease and determine on the thirtieth day of June, one thousand nine hundred and eight."

The following section is hereby substituted:—

"5. Payment of the said bounty may be made on all such lead-bearing ores mined in Canada, and delivered at smelter in Canada on or after the first day of July, one thousand nine hundred and three; and the said bounties shall cease and determine on the thirtieth day of June, one thousand nine hundred and eight."

BROKEN HILL MINING INDUSTRY IN 1903.

Eng. and Mining J., Aug. 11, 1904.

In the Broken Hill district in New South Wales there were 12 mines in operation during the year 1903, which raised 1,078,442 long tons of sulphide ore, removed 195,969 cub. yds. of material from open cuts, and filled 270,254 cub. yds. into depleted slopes. They used 13,864,399 superficial feet of timber, 830,385 lb. of explosives, 438,089 detonators, and 57,030 coils of fuse, the total value of explosives, including fuse and detonators, being 21,926*l*. The consumption of coal was 70,644 tons. The aggregate of engines was 10,456 h. p., and of boilers 9,300 h. p. The total value of plant on the mines was 620,487*l*. The consumption of explosives per ton of ore raised was about 0.3 lb.; of timber, about 12.5 ft.; of coal, about 0.07 ton. The total number of men employed at the end of the year was 5,626.

From 1,100,514 tons of ore raised there were obtained the following profitable products:—

Galena concentrates, 203,416 tons, containing 5,488,498 oz. of silver, 2,135 oz. of gold, 117,078 tons of lead, and 17,063 tons of zinc. Average grade = 26.7 oz. of silver per ton, 57.5 per cent. of lead, and 8.4 per cent. of zinc.

Oxidised ore, 22,072 tons, containing 895,681 oz. of silver and 4,065 tons of lead.

Slimes, 61,498 tons, containing 1,103,350 oz. of silver, 11,654 tons of lead, and 10,085 tons of zinc.

Zinc concentrates, 21,634 tons, containing 395,416 oz. of silver, 2,606 tons of lead, and 3,885 tons of zinc. Average: 13.7 oz. of silver per ton, 12 per cent. of lead, and 38.8 per cent. of zinc.

The total amount of the profitable products was 308,681 tons, while 826,497 tons of slimes, middlings, and tailings, containing 5,039,466 oz. of silver, 52,075 tons of lead, and 148,516 tons of zinc were either dumped on the surface, with a view to possible future treatment, or were returned to the mine as filling.

The 1,100,514 tons of ore raised comprised 22,072 tons of oxidised and 1,078,442 tons of sulphide. The latter contained 11,867,157 oz. of silver, 183,416 tons of lead, and 184,011 tons of zinc. The average grade of the sulphide ore was therefore about 11 oz. of silver, 17 per cent. of lead, and 17 per cent. of zinc.

• BOHEMIA; MINING INDUSTRY IN —.

Foreign Office Annual Series, No. 3255.

In Bohemia there are 21 undertakings for silver mining, of which three were being worked in 1903. The mines are worked by the Imperial Government, and in 1903 produced 21,958 tons of ore, giving 86,000 lb. of silver, worth 138,160*l*.

There are six copper mines in Bohemia, of which one was being worked on a small scale in 1903, and 10 tons of ore were produced. In the whole of Austria there were only 11 being worked, producing 12,688 tons of ore, which yielded 961 tons of copper worth 57,542*l*. There were 310 tons of copper sulphate produced, an increase on 1902 of 62 tons.

Bohemia is particularly rich in iron ore deposits, and they are to be met with in all parts of the Kingdom. The richest deposits are in the strata of silurian formation running south-west to north-east from Bischofteinitz through Pilsen, Beraun, and Prague, as far as the River Elbe at Celakowitz, for a distance of over 20 miles. It attains its greatest breadth (10 miles) in the neighbourhood of Pilsen, whilst towards the Elbe it gradually narrows down to 4 miles. This silurian basin contains an almost inexhaustible quantity of iron ore. The iron ore beds between Prague and Beraun are now being worked, and produce more than one-third of the total output in Austria. Beside the underlying beds with fine-grained hematite, containing over 50 per cent. of iron, two hanging beds are being worked, containing some reddish-brown oolitic hematite of great purity, yielding as high as 52 per cent. of iron, but more frequently red clay iron ore with a yield of from 30 to 40 per cent. of iron. This ore forms the chief richness of the silurian beds of Bohemia. In the year 1903, 693,435 tons of iron ore were produced from 20 mines, out

of a total of 78 in Bohemia. In the whole of Austria 37 mines were being worked last year, producing 1,715,984 tons of iron ore, at an average price of 7*s*. 2*d*. per ton. The production was 28,312 tons less than in 1902. The amount of crude iron produced in Bohemia in 1903, in 10 works, was 286,593 tons. The total in Austria was 970,883 tons in 38 works.

NORWAY; MINING INDUSTRY OF —.

Foreign Office Annual Series, No. 3252.

The copper and pyrites mines at Trondhjem have been worked with good results during 1903, and one mine, which had not been worked for 200 years, has been restarted, and is very rich. The existence is reported of iron veins of some importance at Larvik and Sandefjord. The molybdenite mines at Hekkefjord are reported as not being a success. About 80 tons, valued at from 150*l*. to 200*l*. per ton, were exported last year. These prices did not pay, so that the company are now turning their attention to ferromolybdenum, which it is anticipated will yield better results. A large quantity of copper, iron and copper pyrites, amounting in all to 63,446 tons, and valued at 139,500*l*., were exported from Bodø in 1903.

The total number of mining works of all kinds in operation at the close of 1903 is stated to be 37, employing 3,550 workpeople, and yielding produce of the total value of about 310,000*l*.

GOLD AND PLATINUM INDUSTRY IN RUSSIA.

Foreign Office Annual Series, No. 3253.

Taking the production of gold for 1903 at 1,184,000 oz., the Russian Empire comes fourth on the list of gold producing regions, and produces 7 per cent. of the whole world's supply. A large tract in Northern Manchuria was being prospected and worked under Australian management when war broke out. In the Ural district great efforts are being made to develop the industry.

In the valley of the river Ivalo, at Kultana, about half-way between the Arctic Ocean and the Gulf of Bothnia, work has been carried on since 1870, but, though the ore is described as being rich (1.96 to 8.25 grms. per cb. m.), the yield from that date to 1899 is valued at only 55,000*l*. The Finnish gold-bearing district is a tableland about 30 miles long by 10 miles broad; the richest finds have been made near Haugasojä, on a southern affluent of the Ivalo; veins of quartz yielding 67.7, 78.7, 217.4, and even 289.6 grms. per ton, are alleged to have been crushed, but the financial results do not appear to have been great so far. The quantity of platinum mined in 1903 was a little under 6 tons (366 poods against 374 poods in 1902). Only a trifling quantity was worked up into articles in Russia, the rest being sent abroad in its natural or refined state, exactly one-half of it to the United Kingdom, against four-fifths in 1901. There is a continually increasing demand for platinum for the making of jewellery, chemical and assaying apparatus.

XII.—FATS, FATTY OILS, Etc.

COD FISHERIES IN NORWAY.

Foreign Office Annual Series, No. 3252.

The winter fisheries of cod yielded 44,600,000 fish against 41,000,000 in 1902 and 40,000,000 in 1901. The average for the preceding 35 years was 53,000,000. The fish were, however, very light in weight. The production of cod-liver oil was the smallest for many years, owing to the poor quality of the fish—amounting to only 3,000 barrels. Prices opened at 9*l*. per barrel, but later rose to 24*l*. per barrel. The total quantity exported was about 25,000 barrels against 34,500 barrels in 1902. For other sorts of fish oil 7,000 barrels of liver were obtained against 21,900 barrels in 1902.

XIII. C.—INDIA-RUBBER, Etc.

INDIARUBBER EXPORT FROM THE AMAZON.

Bd. of Trade J., Aug. 25, 1904.

The following table, showing the quantity of indiarubber exported from the river Amazon during the year 1903—04,

including direct shipments from Iquitos (Peru) and Serpa (State of Amazonas) and rubber in transit from Bolivia, has been compiled from figures furnished by H.M. Consul at Pará:—

	To Europe.			
	Manaos.	Pará.	Iquitos.	Serpa.
	Kilos.	Kilos.	Kilos.	Kilos.
Fine.....	3,638,085	4,012,093	621,703	3,790
Medium.....	558,158	484,820	109,769	..
Coarse.....	801,589	1,606,314	249,254	1,148
Caucho.....	1,985,521	638,869	1,033,363	..
Total.....	6,983,558	6,740,796	2,005,089	4,938

	To United States of America.			
	Manaos.	Pará.	Iquitos.	Serpa.
	Kilos.	Kilos.	Kilos.	Kilos.
Fine.....	5,262,573	2,114,249	2,949	..
Medium.....	1,131,216	369,200	179	..
Coarse.....	1,207,758	3,764,577	1,050	..
Caucho.....	1,137,093	65,410	7,386	..
Total.....	8,738,550	6,333,436	11,614	..

The total quantity of rubber exported to Europe during the year 1903-4 was 15,450,091 kilos., as compared with 15,360,651 kilos. during the previous year; 15,083,400 kilos. was exported to the United States of America, as compared with 14,565,816 during the previous year; while the total export figures are 30,533,491 kilos. for 1903-4, and 29,826,467 for 1902-3.

XVI.—SUGAR, STARCH, Etc.

SUGAR FACTORY IN TURKESTAN.

Foreign Office Annual Series, No. 3253.

A well-equipped sugar factory, worked by hydraulic power on the turbine system, has been built at Kaufmannskaya station, 80 versts (about 20 miles) from Tashkent, being the first establishment of the kind in Turkestan; it is to begin working in the autumn of 1904, when the first crop of beetroot is harvested; it cost 60,000*l.* and is to turn out 5,000 tons of sugar annually. Over 8,000 acres of beetroot are being planted, and in 1905 the area is to be increased to 10,000 acres of irrigated land; the white beet yields 24 cwt. of sugar per acre, the red beet less.

XVII.—BREWING, WINES, SPIRITS, Etc.

ALCOHOL FOR INDUSTRIAL PURPOSES; DUTY-FREE —.

The Times, Sept 3, 1904.

The Chancellor of the Exchequer has appointed the following gentlemen to serve as members of a committee to inquire into the use of duty-free alcohol for industrial purposes:—Sir Henry Primrose, K.C.B., C.S.I., chairman; Prof. Sir William Crookes, F.R.S.; Sir W. H. Holland, M.P.; the Hon. J. Scott-Montagu, M.P.; Lothian D. Nicholson, Esq.; Dr. W. Somerville; Dr. T. E. Thorpe, C.B., F.R.S.; Thomas Tyrer, Esq.

The terms of reference are:—"To inquire into the existing facilities for the use, without payment of duty, of spirits in arts and manufactures, and, in particular, into the operation of section 8 of the Finance Act, 1902; and to report whether the powers conferred upon the Commissioners of Inland Revenue by this section permit of adequate facilities being given for the use of spirits in manufactures, and in the production of motive power, or whether further facilities are required; and, if it should appear to the committee that the present facilities are inadequate, to advise what further measures could be adopted without prejudice to the safety

of the revenue derived from spirits and with due regard to the interests of the producers of spirits in the United Kingdom."

All communications should be directed to Sir Henry Primrose, K.C.B., at Somerset House, Strand, W.C.

Patent List.

N.B.—In these lists, [A.] means "Application for Patent," and [C.S.] "Complete Specification Accepted."

Where a Complete Specification accompanies an Application, an asterisk is affixed. The dates given are (i) in the case of Applications for Patents, the dates of application, and (ii) in the case of Complete Specifications Accepted, those of the Official Journals in which acceptances of the Complete Specifications are advertised.

Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, AND MACHINERY.

- [A.] 17,772. Forbes. Filtering apparatus.* Aug. 16.
 " 17,795. Marshall. Filters or gas purifiers. Aug. 16.
 " 17,816. Elmore. Processes and apparatus for separating certain constituents of finely divided material by causing them to rise or float in a liquid. Aug. 16.
 " 17,854. Sharratt and Sharratt. Kilns, ovens, furnaces and the like. Aug. 17.
 " 17,957. Tobler, and Rhein. Webstuhl and Appreturmaschinenfabr. Drying apparatus.* Aug. 18.
 " 18,094. Marlow and E. Allen and Co. Drying apparatus. Aug. 20.
 " 18,305. James. Apparatus for ascertaining the specific gravity of liquid or semi-liquid material. Aug. 24.
 " 18,382. Féry, and Cie. pour la Fabrication des Compteurs et Matériel d'Usines à Gaz. Pyrometers.* Aug. 24.
 " 18,488. Lennox. Evaporators for evaporating the liquid in brewers' wash, sewage, waste or spent dyes, &c. Aug. 26.
 " 18,512. Lake (Dessoliers and Begnier). Apparatus for treating solids with liquid, fluid, or gaseous agents.* Aug. 26.
 " 18,531. Zeal. Thermometers. Aug. 26.
 " 18,539. Helm. Cooling apparatus. Aug. 26.
 [C.S.] 28,183 (1903). Sellenscheidt. Method of and apparatus for decanting fluids under pressure. Aug. 24.
 " 11,839 (1904). Cantley. Centrifugal hydro-extractors. Aug. 31.
 " 14,434 (1904). Reese. Whisking, agitating, and mixing machines. Aug. 24.
 " 15,713 (1904). Paradis. Funnels. Aug. 24.
 " 15,875 (1904). Waldbaur. Apparatus for heating liquids. Aug. 31.

II.—FUEL, GAS, AND LIGHT.

- [A.] 17,712. Nash. Gas producers.* Aug. 15.
 " 17,795. Marshall. See under I.
 " 17,906. Zuiderhock. Process for the manufacture of coke briquettes. Aug. 17.
 " 18,047. Haber. Process of and means for controlling the composition of gaseous mixtures. Aug. 20.
 " 18,214. Hatton. Operating gas producers. Aug. 23.
 " 18,262. Koppers. Coke ovens.* Aug. 23.
 " 18,364. Verdier and Teuton. Gas retorts. [Fr. Appl., Sept. 2, 1903.]* Aug. 24.
 " 18,456. Shiels. Production of combustible vapour or gas. Aug. 25.
 " 18,487. Junkers. Method of and apparatus for determining the heating value of fuel. [Ger. Appl., Sept. 1, 1903.]* Aug. 26.

- [C.S.] 21,149 (1903). Crossley and Rigby. Gas producers. Aug. 24.
 " 2240 (1904). Capitaine. Method of and means for purifying the gas of gas producers. Aug. 31.
 " 5333 (1904). Dewey. Mantles for incandescent gas burners. Aug. 24.
 " 11,948 (1904). Guilbaud. Apparatus for generating gas. Aug. 24.
 " 12,221 (1904). Deschamps. Gas producers. Aug. 31.
 " 14,007 (1904). Diehl, Showalter, Grube, and Showalter. Apparatus for producing air-gas. Aug. 24.
 " 16,067 (1904). Grice. Gas producers. Aug. 31.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM, AND MINERAL WAXES.

- [A.] 18,301. Schnell. Means for rendering petroleum or petroleum spirit non-inflammable until heated or vapourised. Aug. 24.

IV.—COLOURING MATTERS AND DYESTUFFS.

- [C.S.] 17,982 (1903). Johnson (Badische Anilin und Soda Fabrik). Oxidation of methyl groups of aromatic hydrocarbons. Aug. 24.
 " 22,289 (1903). Ransford (Cassella and Co.). Manufacture of *p*-acetylamino-*o*-aminophenol and dyestuffs therefrom. Aug. 24.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

- [A.] 17,775. Hunter, Moser, and Burrows. Retting and preparing fibrous stems or straws, especially flax, preparatory to scutching. Aug. 16.
 " 17,822. Carstanjen. Mordanting and loading silk and other textile fabrics. Aug. 16.
 " 18,956. Rhodes. Apparatus for dyeing and otherwise treating with liquids wool, yarn, and other fibrous material. Aug. 20.
 " 18,069. Dawson. Wool washing and scouring machinery. Aug. 20.
 " 18,084. Sherman. Treatment of rhea, grass, wood fibre, and the like. Aug. 20.
 " 18,194. Brossard. Apparatus for dyeing, cleaning washing, and the like. Aug. 22.
 " 18,488. Lennox. See under I.
 [C.S.] 22,189 (1903). Thompson (Wyser). Apparatus for mercerising yarn. Aug. 24.
 " 22,869 (1903). Beutner. Dyeing apparatus. Aug. 24.
 " 6728 (1904). Knuip. Process for dyeing silk a blue-black colour after it is weighted. Aug. 24.
 " 18,090 (1904). Haddan (Elosegui). Fulling of woollen fabrics or other fibres or materials adapted to be felted. Aug. 24.
 " 15,978 (1904). Bauersachs and Brückner. Processes of dyeing cops. Aug. 31.

VI.—COLOURING WOOD, PAPER, LEATHER, ETC.

- [A.] 18,096. Abel (Act.-Ges. f. Anilinfabr.). Process of dyeing leather. Aug. 20.
 " 18,303. Dean and Co., Ltd., and Possnett. Method of and means for dyeing skins in the manufacture of leather. Aug. 24.

VII.—ACIDS, ALKALIS, AND SALTS.

- [A.] 17,794. Lake (Soc. Anon. Ing. L. Vogel per la Fabr. di Concimi Chimici). The manufacture of sulphuric acid. Aug. 16.
 " 17,888. Wilton. Treatment of leucite or other alkali aluminium silicates for the obtainment of useful products. Aug. 17.
 " 17,985. Lake (Soc. Romana Solfati). Treatment of leucite and similar aluminous silicates. Aug. 18.

- [A.] 18,049. Le Sueur. Liquefying air. Aug. 20.
 " 18,239. Brindley. Treatment of spent acid from galvanisers' liquors and the like, and the manufacture of the pigment oxide of iron. Aug. 28.
 " 18,283. Carter. Manufacture of sulphate of ammonia. Aug. 23.

- [C.S.] 17,640 (1903). Ashcroft. Production of alkali metals. Aug. 24.
 " 14,966 (1904). Schilling and Kremer. Process for the extraction of ammonia from the sewage waters of towns and similar liquids. Aug. 31.
 " 15,308 (1904). Betts. Process of making lead dithionate. Aug. 24.

VIII.—GLASS, POTTERY, AND ENAMELS.

- [A.] 18,609. Fitzmaurice. Method of treating molten or semi-molten glass. Aug. 27.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

- [A.] 17,692. Howden. Process of wood preserving and the apparatus to be used therein. Aug. 15.
 " 17,736. Powell. Vulcanising, preserving and treating timber. Aug. 16.
 " 17,870. Elmes. Manufacture of artificial stone, plaster, or plastic material. Aug. 17.
 " 18,437. Bottomley and Paget. The working of fused silica. Aug. 25.
 " 18,584. Hamblet. Brick kilns and other like kilns. Aug. 27.

X.—METALLURGY.

- [A.] 17,676. Clinch-Jones. Heat treatment of metals to prevent decarbonisation and oxidation. Aug. 15.
 " 17,707. Heskett. Process of and apparatus for obtaining metallic lead and zinc and other metals from their sulphides. Aug. 15.
 " 18,027. Lett, and Metalia, Ltd. Treatment of ores containing copper, silver, and gold. Aug. 19.
 " 18,357. Hunter and Herbert. Preparing aluminium plates, zinc plates, &c., for lithographic printing purposes. Aug. 24.
 " 18,363. Evans. Enrichment of ores. Aug. 24.
 " 18,415. MacIvor and Burnett. Treatment of crude silver and silver alloys. Aug. 25.
 " 18,537. Barton and McGhie. Processes for the extraction of copper, nickel, and cobalt. Aug. 26.
 " 18,568. Herzog. Composition for welding or soldering cast iron.* Aug. 27.
 [C.S.] 19,984 (1903). Price. Furnaces especially adapted for separating gold or other precious metals from the sweepings of jewellers' warehouses, photographers' waste, &c. Aug. 24.
 " 22,078 (1903). Prescott and Green. Manufacture of metallic alloy. Aug. 24.
 " 22,308 (1903). Higham. Cupola furnaces for melting iron. Aug. 24.
 " 22,767 (1903). Talbot. Manufacture of ingot iron and steel. Aug. 31.
 " 23,145 (1903). Gührs and Gührs. Treatment of zinc. Aug. 31.
 " 24,493 (1903). Savelberg. Process for desulphurising lead ores. Aug. 24.
 " 25,986 (1903). Marks (Lamargese). Process for case hardening. Aug. 24.
 " 16,448 (1904). Harmer. Process and apparatus for refining cast iron. Aug. 31.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

- [A.] 17,784. Ashcroft. Electrolytic cells. Aug. 16.
 " 18,042. Imray (Meister, Lucius, und Brüning). Processes of oxidation and reduction effected in an electrolytic bath. Aug. 19.
 " 18,356. Bartelt. Electrolysers. Aug. 24.
 " 18,403. Townsend. Electrolytic process, and apparatus therefor. Aug. 25.

- [A.] 18,501. Wallace and Sandy. Primary batteries. Aug. 26.
 " 18,594. Fiedler and Gerard. Galvanic batteries. Aug. 27.

XII.—FATTY OILS, FATS, WAXES, AND SOAP.

- [A.] 17,965. Horn. Process for the preparation of soaps. Aug. 18.
 " 18,022. Daum. Machine for solidifying liquid soap in moulds. Aug. 12.
 " 18,152. Nusch (Chem. Werke. G. m. b. H. vorm. Dr. C. Zerbe). Process for making durable soap preparations for use in preventing poisoning by compounds of lead, copper, arsenic, mercury, and other metals.* Aug. 22.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, ETC.

(A.)—PIGMENTS, PAINTS.

- [A.] 18,289. Brindley. *See under VII.*
 " 18,391. Fischer. Preparation of printing inks for the immediate superimposition of colours in trichromatic printing or any other multicolour process. Aug. 25.
 [C.S.] 17,895 (1903). Malzac. Preparations of zinc for use as a paint. Aug. 24.

(B.)—RESINS, VARNISHES.

- [A.] 18,376. Walton. Manufacture of floor cloth, wall coverings, &c., and apparatus for use therewith. Aug. 24.
 [C.S.] 17,971 (1903). Seeser. Manufacture of linoleum or the like. Aug. 24.

(C.)—INDIA-RUBBER.

- [C.S.] 22,986 (1903). Seguin and Roussy de Sales. Method of manufacturing artificial caoutchouc. Aug. 31.

XIV.—TANNING, LEATHER, GLUE, SIZE, ETC.

- [A.] 17,979. Müller. Manufacture of imitation leather.* Aug. 18.
 " 18,096. Abel (Act.-Ges. f. Anilinfabr.). *See under VI.*
 " 18,135. Flek. Method of treating leather.* Aug. 22.
 " 18,267. Bailly. The treatment or preserving of skins. Aug. 22.
 " 18,303. Dean & Co., and Possnett. *See under VI.*
 " 18,514. Amend. Deliming, bating and tanning hides and skins [U.S. Appl., Sept. 3, 1903]. Aug. 26.*
 [C.S.] 19,017 (1903). Foelsing. Manufacture of albumen from fish. Aug. 24.
 " 15,629 (1904). Piesbergen. Artificial leather and its manufacture. Aug. 24.

XV.—MANURES, ETC.

- [C.S.] 18,361 (1904). Mathesius. Process of manufacturing an artificial manure. Aug. 24.

XVII.—BEWING, WINKS, SPIRITS, ETC.

- [A.] 17,687. Bradin and Baines. Method of ageing or maturing spirits. Aug. 15.
 " 17,749. Richardson. Aërated waters, alcoholic and other drinks. Aug. 16.
 " 18,018. Deichmann and Deichmann. Malting processes [Ger. Appl., Aug. 26, 1903].* Aug. 19.
 " 18,488. Lennox. *See under I.*

XVIII.—FOODS; SANITATION, WATER PURIFICATION; & DISINFECTANTS.

(A.)—FOODS.

- [A.] 17,818. Bouma and Selhorst. Process for the production of milk free from sugar. Aug. 16.
 " 18,441. Lake (Belmont). Manufacture of coffee substitutes.* Aug. 25.
 [C.S.] 14,010 (1904). Lehmann. Process for humanising cows' milk and condensing it to a dry state. Aug. 24.
 " 16,189 (1904). Barbier. Method of converting whey into vinegar. Aug. 31.

(B.)—SANITATION; WATER PURIFICATION.

- [A.] 17,920. Mather and Platt, Ltd., and Hepburn. Method of and means for softening water. Aug. 18.
 " 17,994. Mather and Platt, Ltd., and Hopkinson. Methods of and means for purifying, softening and treating water. Aug. 19.
 " 18,152. Nusch (Chem. Werke G. m. b. H. vorm. Dr. C. Zerbe). *See under XII.*
 " 18,484. Hawliczek. Purification of distillery or like refuse effluents. Aug. 26.
 " 18,488. Lennox. *See under I.*
 [C.S.] 20,025 (1903). Cowie. Bacterial bed system of treating distillery or other impure effluents containing matter in suspension. Aug. 31.
 " 14,003 (1904). Schweitzer. Apparatus for treating sewage and other fluids. Aug. 31.
 " 14,966 (1904). Schilling and Kremer. *See under VII.*

XIX.—PAPER, PASTEBOARD, ETC.

- [A.] 17,929. Morris and The Cornbrook Chemical Co., Ltd. Manufacture of paper. Aug. 18.
 " 18,117. Bradley. Paper-making machines. Aug. 22.
 " 18,371. Lake (Soc. Cartiers di Maslianico). Manufacture of waterproof paper. Aug. 24.
 [C.S.] 22,299 (1903). Cave-Brown-Cave. Apparatus for the treatment of celluloid, &c. Aug. 24.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

- [A.] 18,147. Wetter (F. Hoffmann-Laroche and Co.). Pharmaceutical compound, and process for the manufacture of the same. Aug. 22.
 " 18,602. Askenasy and Mugdan. Process for producing acetylene tetrachloride.* Aug. 27.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

- [A.] 18,183. Gaedicke. Process for the production of silver emulsions.* Aug. 22.
 [C.S.] 22,722 (1903). Newton (Bayer and Co.). Sensitising photographic emulsions with the aid of dyestuffs. Aug. 24.

XXII.—EXPLOSIVES, MATCHES, ETC.

- [A.] 17,880. Boyd. Manufacture of explosive compositions.* Aug. 17.
 " 18,188. Guthridge. Explosive compounds. Aug. 22.
 " 18,269. Le Brocq. Manufacture of cordite and the like. Aug. 23.
 [C.S.] 22,379 (1903). Clark (Badische Maschinenfabr. u. Eisengiesserei vorm. G. Sebold, und Sebold und Neff). Finishing machines for wood matches. Aug. 24.
 " 3253 (1904). Haddan (Führer). Explosives. Aug. 31.

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I.—PLANT, APPARATUS, AND MACHINERY.

ENGLISH PATENTS.

Evaporating or Concentrating Apparatus. J. and C. McNeil, Govan, Scotland. Eng. Pat. 20,777, Sept. 28, 1903.

A HOLLOW shaft, divided internally into steam and water spaces, is provided with projecting radial pipes, also divided internally into steam and water spaces, which latter communicate with the steam and water spaces of the shaft. The whole is arranged in a vacuum pan. Means are provided for rotating the shaft, for introducing the steam, and for allowing the condensed water to escape.

—W. H. C.

Roasting Chemicals and the like; Apparatus for —. T. P. Thomas, J. L. Richardson, and P. Davies, Swansea. Eng. Pat. 21,896, Oct. 12, 1903.

The apparatus, which is specially suitable for the manufacture of oxalic acid, consists of a shallow circular pan which can be rotated above a furnace. Above the pan are girders from which depend suitable, adjustable, stationary stirrers. A cover luted in sand encloses the pan and stirrers in such a way as to prevent the escape of the gases except by the proper exit.—W. H. C.

Decanting Fluids under Pressure; Method of and Apparatus for —. C. Sellenscheidt, and Filter u. Brautechn. Maschinen Fabr., A.-G., vorm. L. A. Enzinger, Berlin. Eng. Pat. 23,183, Oct. 26, 1903.

SEE Fr. Pat. 338,188 of 1903; this J., 1904, 600.—T. F. B.

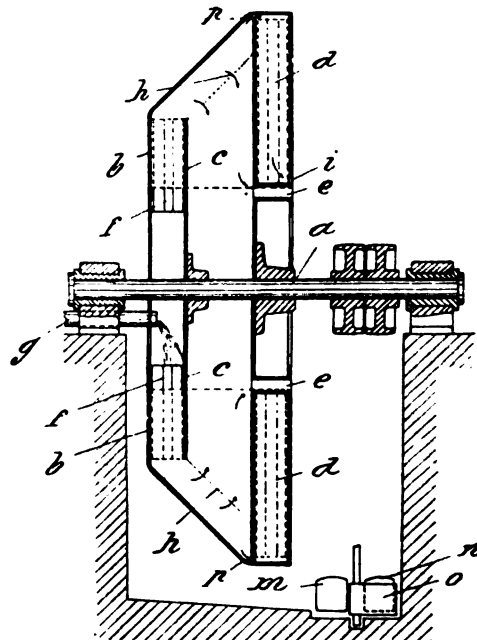
Casks or Vessels from which Liquid is Discharged under Pressure; Impls. in —. O. Imray, London. From Deutsche Steinzeugwaaren Fabrik für Canalisation und Chem. Ind., Friedrichsfeld, Germany. Eng. Pat. 14,752, June 30, 1904.

THE air inlet and discharge-valves are operated by separate floats, in such a manner that the air supply is cut off before the vessel is quite emptied of liquid. The expansion of the compressed air completes the emptying.—W. H. C.

Purifying Liquids by Centrifugal Force; Apparatus for —. G. Sägasser, Zwickau, Germany. Eng. Pat. 8481, April 13, 1904.

THE conical drum *b* and the distributing plate *c* are keyed upon the horizontal shaft *a*, which is mounted above

a trench, and can be rotated. From the edge of *c* a perforated metal sheet *h* is arranged parallel to the conical wall of the drum, and attached to one side of the mud-collecting chamber *d*. The liquid to be purified, e.g., muddy water, enters by the pipe *g*, which projects into the drum *b* through a central circular opening. The mud, along with a little water, is thrown by centrifugal force against the conical wall of the drum, and passes into the



mud collector *d* through the circular channel *p*, whilst the clear water, it is stated, passes through the perforated plate *h*, and flows away through *e*, *e*. At first a small stream of clear water also flows out of the opening *i* in the mud chamber, but when the latter is full, this becomes muddy, and the apparatus is stopped and cleaned out. The clear water and muddy liquid flow away by the two channels *m*

and *n*, either of which can be shut off by the trap *c*. When the apparatus is running, the clear-water channel is left open; when muddy liquid begins to come out of *i*, this is closed and the muddy-water channel is opened.—W. H. C.

Whisking, Agitating, and Mixing Machines. L. C. Reese, London. Eng. Pat. 14,434, June 27, 1904.

Two sets of beaters, revolving the one within the other and in opposite directions, are carried upon a frame. The whole fits into slots arranged in the vertical sides of the pan, and can be removed if required. Suitable means for driving the beaters are provided.—W. H. C.

UNITED STATES PATENTS.

Drying Oven. M. M. Suppes and O. Phelps, Elyria, Ohio. U.S. Pat. 768,203, Aug. 23, 1904.

On a suitable perforated base is arranged a movable sheet metal cover, forming the top and side walls of the oven. Means are provided for heating and circulating the air, and for luting the cover with sand.—W. H. C.

Crystallising Apparatus. E. von Seemen and E. Rühle, Rheinfelden, and O. Faller, Basel, Switzerland. U.S. Pat. 768,314, Aug. 23, 1904.

See Eng. Pat. 19,034 of 1902; this J., 1902, 1386.—T. F. B.

FRENCH PATENTS.

Radioactive Substances; Apparatus for Utilising and Storing — E. Armet de Lisle. Fr. Pat. 341,833, April 1, 1904.

The radium salt is contained in a glass cup covered by a plate of ebonite which is screwed down to the top of the ebonite cup in which the glass cup stands. The ebonite cup is placed in a leaden vessel with a screw lid, india-rubber rings being used to make tight joints.—L. F. G.

Centrifugal Separator. Aktiebolaget Separator. Fr. Pat. 342,115, Feb. 9, 1904.

Inside the drum of the apparatus, which is provided with a screw cover, two short vertical shafts are placed midway between the centre and the circumference. Each shaft carries a set of curved blades, and a toothed wheel, which engages with another toothed wheel fixed to the central shaft, and is thus rotated in the reverse sense to the drum. The curved blades or rakes remove the solid material deposited on the pervious wall of the drum, and carry it towards the centre, where it falls through an aperture into an annular space below, from which it is expelled by the action of centrifugal force through suitable holes to the outside of the apparatus. The cover of the drum is provided with an inlet pipe and a suitable distributor, and with holes for the escape of the separated liquid.—L. F. G.

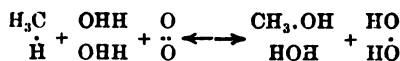
II.—FUEL, GAS, AND LIGHT.

Combustion; Retardation of — by Oxygen.

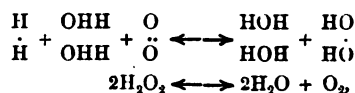
H. E. Armstrong. Proc. Roy. Soc., 1904, 74, 85—89.

According to H. B. Dixor, carbon monoxide, rather than the dioxide, is the initial product of the combustion of carbon and its gaseous compounds; and the same author has shown that water plays a peculiar and all-important part in the combustion of the monoxide; and, further, that in a number of cases oxygen is by far the most effective diluent in retarding combustion. As an explanation of these results and also of later ones by Bone and Wheeler (Chem. Soc. Trans., 1902, 81, 536; 1903, 83, 1074) and Bone and Stockings (this J., 1904, 601), the author puts forward the following views as to the mechanism of combustion:—(1) In the combustion of hydrocarbons, the latter initially merely undergo hydroxylation. (2) At a certain stage in the hydroxylation, thermoschisms begin to take place. Thus dihydroxymethane breaks up as soon as it is formed, into water and formaldehyde, which latter is, in turn, easily resolved into hydrogen and carbon monoxide, $\text{CH}_2(\text{OH})_2 \rightarrow \text{CH}_2\text{O} + \text{OH}_2 \rightarrow \text{CO} + \text{H}_2 + \text{OH}_2$. In like manner, dihydroxyethane gives rise to acetaldehyde,

which, under some conditions, breaks up into methane and carbon monoxide, $\text{C}_2\text{H}_4(\text{OH})_2 \rightarrow \text{CH}_4 + \text{CO} + \text{OH}_2$. (3) In the case of more complex hydrocarbons, these are to a large extent resolved into thermoschisms prior to oxidation, e.g., $\text{C}_6\text{H}_{14} \rightarrow \text{C}_2\text{H}_6 + \text{C}_4\text{H}_{10}$; $\text{C}_2\text{H}_6 \rightarrow \text{C}_2\text{H}_4 + \text{H}_2$. The change may extend even to the formation of carbon when a relatively small proportion of oxygen is present. It is probable that such thermoschisms play an all-important part in high temperature changes (explosions). (4) The reaction by which the oxygen is introduced into the hydrocarbon molecule is regarded as being electrolytic in character, the electrolyte, i.e., conducting water, being the immediate source of the oxygen, whilst the oxygen molecule plays the part of depolariser; it is probable that the water molecules contribute hydroxyl rather than oxygen. The process may be formulated as involving the conjugation of hydrocarbon with water (acting primarily as the catalyst or associating agent) and oxygen, thus:—



(5) Carbon dioxide is the final product of the change, and in its formation from the monoxide the latter is first converted into formic acid. This affords an explanation of why the presence of so large a proportion of water is required in order that the explosive wave may attain to its greatest velocity, the affinity of water for carbon monoxide being relatively slight, and the reversible change one which takes place mainly in the direction $\text{HCO}(\text{OH}) \rightarrow \text{CO} + \text{OH}_2$. (6) Oxygen has a marked influence in retarding the combustion of electrolytic gas, whilst hydrogen has the opposite effect, and nitrogen retards the explosion less than does an excess of oxygen. In seeking for an explanation of these facts, the author points out that the stability of hydrogen peroxide is at a maximum at a high temperature, and that probably water is readily oxidised at temperatures such as prevail in explosions. Then, if the formation of water be regarded as involving the changes—



it follows that water and oxygen will mutually hold each other in check, owing to formation of hydrogen peroxide, which may be looked upon as relatively, if not entirely, inoperative as an oxidising agent at high temperatures in presence of oxygen. The influence of hydrogen in accelerating the combustion is also explicable by the above view, the hydrogen serving to promote the dissociation of the hydrogen peroxide, by diminishing the proportion of active oxygen present.—A. S.

Pentane Lamp; Investigations on the — C. C. Puterson. Brit. Assoc., 1904. J. Gas Lighting, 1904, 87, 606.

INVESTIGATIONS have been carried out at the National Physical Laboratory in order to determine the influence on the Harcourt 10-candle pentane lamp of variations in: (1) the barometric pressure, and (2) the amount of water-vapour present in the air. Photometric comparisons were made against two large-bulb Fleming-Ediswan electric standard glow lamps. The double-comparison method was employed, the electric lamps being used to standardise a comparison glow lamp anew for each experiment, so that it was only necessary to burn the standards for 5 or 10 minutes at a time. From the results of upwards of 60 observations under different conditions, such as are obtained in ordinary practice, the following formula has been deduced for correcting the candle-power of the lamp to the standard atmospheric conditions of 760 mm. of mercury and 10 litres of water vapour per cb. m. of pure dry air:—Candle-power = $10 + 0.066(10 - \epsilon) - 0.008(760 - b)$, where ϵ is the humidity, and b the height of the barometer in mm. The humidity ϵ represents the number of litres of water vapour per cb. m. of pure dry air at the barometric pressure existing at the time so that if b = height of barometer in

mm., e = aqueous pressure, e_1 = vapour pressure of carbon dioxide present in the atmosphere, then $e = \frac{e_1}{b - e_1} \times 1000$. The standard humidity of 10 litres per 1000, is the mean value for three years found at the Kew Observatory. From the formula given above it follows that a variation of 1 litre per cb. m. in the moisture causes a variation in candle-power of about 0.7 per cent., and that a change of 10 mm. in barometric pressure brings about an alteration of 0.8 per cent. in the illuminating power of the lamp.

—A. S.

ENGLISH PATENTS.

Briquets; Process for Producing Pit-Coal and Coke — C. Plate, Bonn, and J. Lieb, Cologne, Germany. Eng. Pat. 17,074, Aug. 5, 1903.

SEE Fr. Pat. 334,257 of 1903; this J., 1904, 15.—T. F. B.

Fuel; Agglomerant for Use in the Manufacture of Compressed —, and a Process of Preparing the same. R. Middleton, Leeds. Eng. Pat. 17,471, Aug. 12, 1903.

SEE Fr. Pat. 339,370 of 1904; this J., 1904, 709.—T. F. B.

Coke Ovens. H. Koppers, Essen, Germany. Eng. Pat. 17,283, Aug. 8, 1903.

SEE U.S. Pat. 753,146 of 1904; this J., 1904, 365.—T. F. B.

Peat and Materials evolving Volatile Products; Apparatus for Treating — E. K. Carmichael. Eng. Pat. 17,096, Aug. 16, 1903. III., page 897.

Burning Liquid Fuel; Apparatus for — P. Davies, Southfields, Surrey, and The Hydroleum Co., Ltd., London. Eng. Pat. 20,059, Sept. 17, 1902.

THE invention relates more particularly to the combustion chambers of apparatus of the type described in Eng. Pat. 14,791 of 1898 (this J., 1899, 745). The combustion chamber claimed comprises a casing, preferably of metal, lined or not with refractory material, into which the fuel-supply-pipe projects; and a laminated structure of refractory material constituting the firing plate; the two communicating with each other at adjacent ends, and being situated and supported respectively at the exterior and the interior of the heating chamber, furnace, fire-box, or the like. The laminated structure consists of angular members spaced apart, the outer members being rectangular or polygonal and the inner ones more or less L-shaped.—A. S.

Gas Producers. W. J. Crossley and T. Rigby, Manchester. Eng. Pat. 21,149, Oct. 2, 1903.

SEE Fr. Pat. 341,970 of 1904, following these.—T. F. B.

Gas-Plant, comprising Generator Base, Gas Washer, Gas Chamber, Cooling Water Reservoir, and Motor Cylinder Casing; One-Part Foundation Frame for a Complete Suction — J. Hillebrand, Ludwigshafen-on-Rhine, Germany. Eng. Pat. 11,853, May 24, 1904. Under Internat. Conv., Jan. 25, 1904.

A COMBINED frame and base for a complete gas plant and motor is formed so as to receive the different parts, as indicated by the title, and combine them into a compact unit, the frame and base being cast in one piece, or consisting of several castings bolted together.—H. B.

Gas; Apparatus for Generating — F. E. Guilbaud, Levallois-Perret, France. Eng. Pat. 11,948, May 25, 1904.

A GENERATOR for the production of low-grade gas is charged continuously from below by means of Archimedean screws, which convey the fuel into the lower part of the combustion shaft of the generator. A water-sealed trough receives the cinders, which fall from an outlet arranged a short distance above the fire-grate. A superincumbent body of incandescent fuel prevents the escape of smoke in the gas produced. The Archimedean screws may be arranged horizontally, to feed the fuel through a conduit curving upwards into the vertical combustion shaft; or they may work in straight, inclined conduits, arranged almost

tangentially to the inner circumference of the shaft, so that a slight rotary movement is imparted to the stack of fuel in the shaft.—H. B.

Air-Gas; Apparatus for Producing — G. C. Diehl, H. M. Showalter, W. H. Grube, and J. W. Showalter, Butler, Ind., U.S.A. Eng. Pat. 14,007, June 21, 1904.

GASOLINE is fed under pressure from a closed reservoir into a vaporising retort, which is heated by means of a burner supplied with gas from the retort. The main body of gas produced is injected, along with air, into a pipe which rises through the reservoir itself and thence to the place of consumption, this pipe, from its lower end to the part which comes out of the top of the reservoir, being surrounded by a wider pipe, serving as a jacket through which a stream of warm air rises and prevents the condensation of the gas by the cold gasoline. The reservoir is provided at the top with a safety valve, consisting of an upright pipe leading to the outer air and having a diaphragm or valve adapted to give way if the internal pressure becomes excessive, a by-pass pipe permitting the escape of air while the reservoir is being refilled with gasoline.—H. B.

Gasification of Coal or other Materials in the Production of Illuminating or Heating Gas; Apparatus for Use in the — C. C. Carpenter, London. Eng. Pat. 14,718, June 30, 1904.

A VERTICAL retort opens at its lower end into a horizontal chamber, in which coke or other residual material collects. In the horizontal chamber is a "pusher," for the removal of the coke. The pusher consists of a cutter, which cuts through the pile of coke at the intersection of the vertical retort and the horizontal chamber, and a shield behind the cutter, which prevents the contents of the vertical retort falling behind the head of the pusher.—W. C. H.

UNITED STATES PATENTS.

Peat Blocks; Manufacture of — F. W. Gaertner, St. Petersburg. U.S. Pat. 768,445, Aug. 23, 1904.

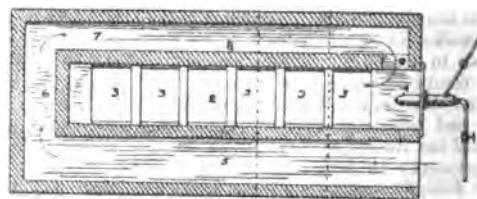
A COLD, dry mixture of peat, powdered rosin, and powdered sulphur is subjected to pressure and slight heating. —W. H. C.

Hydrocarbon Burner. A. M. Hunt and T. Mirk, San Francisco. U.S. Pat. 768,367, Aug. 23, 1904.

THE burner comprises a rectangular frame; a horizontal partition wall in the same, having a series of openings at the sides; air flues extending longitudinally below and communicating with the openings; a longitudinal vaporising flue upon the partition, between the openings, provided with slits alternately upon the sides and top, and with a feeding arrangement for the hydrocarbon, and a body of broken refractory material within the frame, covering the top and sides of the vaporising flue and partition wall.—H. B.

Hydrocarbon Burner [Furnace]. A. M. Hunt and T. Mirk, San Francisco. U.S. Pat. 768,368, Aug. 23, 1904.

THE furnace consists, as shown in the diagram, of a closed outer wall, with an opening in the lower part of one end to admit air; the combustion chamber is formed by two horizontal partitions, extending nearly the entire length of



the outer casing, the upper partition having an opening, 9, to admit the air; the side walls of the outer casing also form the side walls of the combustion chamber. The hydrocarbon is introduced through the nozzle 4, fixed at a point immediately below the opening 9.—T. F. B.

Gas-Generator. J. H. Eustace, Assignor to J. Williamson, Chicago. U.S. Pat. 767,217, Aug. 9, 1904.

THE generator consists of a furnace for heating fuel and superheating steam. Above the furnace, and communicating with it, is a carburetter, by the side of which is a superheater, each of these being filled with chequer brickwork. At one end the carburetter and superheater communicate, and at the other end they are closed to each other. Communicating with the furnace is a chamber in which the superheated steam and "carbonaceous oil" mix, and pass into the carburetter, and thence into the superheater, where the fixed gas is formed.—W. C. H.

Waste Gases; Process of Utilising —. A. Schütt, Charlottenburg, Germany. U.S. Pat. 768,404, Aug. 23, 1904.

HOT waste gases are brought into contact with water in a finely-divided condition travelling in an opposite direction, the water being thus heated to the boiling point. The amount of water supplied is greater than can be converted into steam; the portion remaining liquid absorbs impurities from the gases. The vapour and the purified gases are utilised in heating a liquid of low boiling point.—E. S.

Gas-washing Mechanism. A. M. Hunt and W. S. Dole, San Francisco. U.S. Pat. 768,369, Aug. 23, 1904.

BETWEEN the gas-producer and scrubber are arranged a number of washers, comprising a series of compartments containing the washing liquid, through which the gas has to bubble on its way to the scrubber, means being provided for closing the passage through any of the washers at will.—H. B.

Electrical Apparatus for Clearing Gas. C. G. Hardie. U.S. Pat. 768,450, Aug. 23, 1904. XI. A., page 904.

Incandescent Filaments and Mantles; Manufacture of —. A. M. Plaissetty, Paris. U.S. Pat. 768,073, Aug. 23, 1904.

SEE Fr. Pat. 321,803 of 1902; this J., 1903, 291.—T. F. B.

FRENCH PATENTS.

Fuel Briquettes and their Manufacture. M. G. Larondie. Fr. Pat. 338,863, June 15, 1903.

THE fuel consists of 91.8 parts of coal, 8 parts of cellulose, and 0.2 part of dry sodium nitrate. The cellulose, in the form of rags, is treated in an autoclave with a dilute soda-lye, and warmed till a clear pulp results. This pulp is then mixed with crushed coal treated with a solution of sodium nitrate, and the mixture thoroughly heated and stirred. The mass is then heated in an autoclave under a pressure of eight atmospheres, and, when dry, compressed into blocks by a hydraulic press.—L. F. G.

Agglomerating Finely-divided Materials [Fuel Briquettes, &c.]; Process for —. Soc. Anon. des Mines de Houille de Montralais, Mouzeil et Languin. Fr. Pat. 341,751, April 1, 1904.

COAL, anthracite, lignites, peat, sawdust, leather waste, or other similar material is treated with a solution of a colloid, such as gelatin, gum, or rosin, to which a suitable oxidising agent, such as formol, potassium permanganate, potassium bichromate, or iron perchloride has been added, and the mass formed into blocks and dried. For instance, 92 parts of sawdust are mixed with 8 parts of a solution containing 5 per cent. of gelatin and 2 per cent. of formol. The block, after drying, is stated to possess all the properties of wood, and can be worked and cut.—L. F. G.

Agglutinant for Agglomerating Finely-divided Materials, which becomes Insoluble after Drying. [Fuel Briquettes, &c.] Soc. Anon. des Mines de Houille de Montralais, Mouzeil et Languin. Fr. Pat. 341,752, April 1, 1904.

THE agglutinant is used for the materials specified in Fr. Pat. 341,751 (see preceding abstract), and consists of 1 part of gelatin, to which one-twentieth part of potassium bichromate has been added, dissolved in 4 parts of water.

This is then mixed with 99 parts of anthracite powder, the mass formed into balls, and dried for four to five hours at a temperature of 100°–150° C.—L. F. G.

Fuel; Manufacture of Artificial —. Graigola Merthyr Co., Ltd. Fr. Pat. 341,771, March 30, 1904. Under Internat. Conv., April 6, 1903.

SEE Eng. Pat. 7871 of 1903; this J., 1904, 539.—T. F. B.

Gas Producers; Apparatus for Regulating the Supply of Steam to —. P. M. V. Guignard. Fr. Pat. 341,791, March 31, 1904.

IN this apparatus the pressure in the exhaust of the motor, which is fed by the producer, is utilised for regulating automatically the supply of steam to the producer, in accordance with the gas consumption. A branch pipe from the exhaust enters the upper end of a closed box containing water, and, at each explosion of the motor, the pressure created temporarily within the box forces some of the water up a pipe into a tank above. This tank has an outlet so adjusted that, as the speed of the motor increases (the amount of water forced up into the tank increasing accordingly), the level of the water in the tank rises, and *vice versa*. The water flowing out of the tank passes down into the box again, through a non-return valve; there is thus an almost continuous circulation of the water in the box and tank. A float inside the tank is connected to the steam-supply valve of the producer, and hence, as the float rises or falls with the level of the water, the steam supply is regulated.—H. B.

Gas Producers. W. J. Crossley and T. Rigby. Fr. Pat. 341,970, April 7, 1904.

A GAS producer, the lower end of which rests within a hydraulic seal, is provided with a rotary conical grate, mounted on ball bearings carried by a central cylinder into which the air, or air and steam, is led on its way through the grate. The mechanism for rotating the grate is protected from excessive heating by being situated in one of the conduits through which the air, or air and steam, is led to the central cylinder. The conical grate is of such size as to support only a part of the superincumbent fuel, so that the rotation may be effected easily.—H. B.

Baritic Ores; Preparation of — for the Production of a Double Carbide of Barium and Calcium. J. Cartier. Fr. Pat. 342,036, April 11, 1904. VII., page 901.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM, AND MINERAL WAXES.

ENGLISH PATENTS.

Peat and Materials Evolving Volatile Products; Apparatus for Treating —. E. K. Carmichael, Edinburgh. Eng. Pat. 17,096, Aug. 6, 1903.

PEAT powder, obtained by drying and separating the fibre from peat in an apparatus which forms a part of this patent, is fed through a hopper into a horizontal cylinder provided with a rotating rod, on which are fixed blades to convey the material along the cylinder to an outlet at the further end. There are several of such cylinders arranged one above the other in a furnace, the material being conveyed from one to the other by similar rotating rods. The furnace is so arranged that the lower tubes are more strongly heated. The volatile products are removed from each cylinder by means of outlet pipes, and the hot carbonised material from the lowest cylinder is led through a pipe which passes through a boiler containing water, the steam thus generated being led back to the lowest carbonising cylinder, thereby generating water-gas.—T. F. B.

Filtering and Washing [Lubricating] Oils; Apparatus for —. C. W. Brown. From W. F. Warden. Eng. Pat. 14,216, June 23, 1904. XII., page 905.

FRENCH PATENT.

Benzene, Alcohol, Oil of Turpentine, and Petroleum; Process for Rendering — Uninflamable. G. H. Dilette and J. Talabot. Fr. Pat. 341,927, Feb. 10, 1904.

CARBON tetrachloride is added to the following substances in the proportions given to produce non-inflamable products: benzene or mineral oils, about 15 per cent.; alcohol or oil of turpentine, about 50 per cent. (See also Fr. Pat. 341,158 of 1904; this J., 1904, 885.)—T. F. B.

IV.—COLOURING MATTERS AND DYE STUFFS.

ENGLISH PATENTS.

p-Acetylamido-o-amidophenol, and [Azo] Dye stuffs therefrom; Manufacture of —. R. B. Ransford, Upper Norwood. From L. Cassella and Co., Frankfurt-on-Maine, Germany. Eng. Pat. 22,289, Oct. 15, 1903.

p-ACETYLAMINOPHENOL is nitrated at a low temperature and the nitro compound reduced, *p*-acetamino-*o*-aminophenol being obtained. On coupling the diazo compound of this substance with amines, phenols, or their derivatives, azo dye stuffs dyeing various shades are produced. Thus, the dye stuff obtained by coupling with 1.8-aminonaphthol-5-sulphonic acid gives bluish-violet shades on wool, converted into blackish-blue on chroming; whilst that obtained from 2.5-aminonaphthol-7-sulphonic acid gives red shades, converted into blackish-violet on chroming. The dye stuffs obtained by coupling with the following compounds are also described: aminonaphtholmonosulphonic acids 2.3.6 and 2.6.8; aminonaphtholdisulphonic acids 1.8.3.6 and 1.8.2.4; dihydroxynaphthalenemonosulphonic acid 1.8.4; and dihydroxynaphthalenedisulphonic acid 1.8.3.6.

—T. F. B.

Sulphur Dyes [Sulphide Dye stuffs]; Manufacture of Colouring Matters of the Class known as —, and of an Intermediate Product of the said Manufacture. H. C. Coaway and the United Alkali Co., Ltd., Liverpool. Eng. Pat. 22,966, Oct. 23, 1903.

DINITROBENZENE and sulphanilic acid are heated together in alkaline solution, and the solution acidified; the product obtained thus is salted out of the solution, and heated with an equal weight of *p*-aminophenol, six times its weight of sodium sulphide, and one half its weight of sulphur, until the melt becomes dry. The resulting product dyes green shades, fast to light, acids, and alkalis.—T. F. B.

Anthracene Series; Production of Colouring Matters of the —, and of Intermediate Products relating thereto [Anthracene Dye stuffs]. J. Y. Johnson, London. From Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 23,179, Oct. 26, 1903.

SEE Addition, of Oct. 26, 1903, to Fr. Pat. 319,618 of 1902; this J., 1904, 368.—T. F. B.

Sulphurised [Sulphide] Dye stuffs; Manufacture of —. O. Imray, London. From Soc. Chem. Ind. in Basle. Eng. Pat. 23,188, Oct. 26, 1903.

SEE Fr. Pat. 337,316 of 1903; this J., 1904, 486.—T. F. B.

Gluconides possessing Colouring or Tanning Properties; Processes for Extracting from Vegetable Matters —, and the Products resulting from such Processes. F. J. Oakes, New York. Eng. Pat. 9932, April 30, 1904.

SEE U.S. Pat. 759,008 of 1904; this J., 1904, 604.—T. F. B.

UNITED STATES PATENT.

Glycollic Acid Anilide Orthocarboxylic Acid and Process of Making Indigo. B. Homolka, Frankfurt, and F. von Bolzano, Assignors to Farbwerke vorm. Meister, Lucius und Brüning, Höchst-on-the-Maine, Germany. U.S. Pat. 768,455, Aug. 23, 1904.

SEE Eng. Pat. 4538 of 1903; this J., 1904, 16.—T. F. B.

FRENCH PATENTS.

Basic Dye stuffs; Production of Soluble Salts of —. Badische Anilin und Soda Fabrik. Fr. Pat. 338,857, June 11, 1903.

SEE Erg. Pat. 12,681 of 1903; this J., 1904, 485.—T. F. B.

Anthracene Series; Production of Dye stuffs of the —. Badische Anilin und Soda Fabrik. Second Addition, dated March 2, 1904, to Fr. Pat. 338,529, March 30, 1903. Under Internat. Conv., Feb. 12, 1904.

SEE U.S. Pat. 763,233 of 1904; this J., 1904, 747.—T. F. B.

Sulphide Dye stuffs; Process of Making Yellow —. Act.-Ges. f. Anilinfabr. Fr. Pat. 341,798, March 31, 1904.

SULPHIDE dye stuffs, dyeing clear yellow shades from sodium sulphide solution, are obtained by heating equimolecular quantities of *m*-toluylenediamine and diformyl-*p*-phenylenediamine with sulphur to 220°–230° C. By raising the temperature of the reaction, or by reducing the quantity of diformyl-*p*-phenylenediamine, dye stuffs giving more orange shades are produced.—T. F. B.

Lakes [from Azo Dye stuffs]; Process for Preparing —. Soc. Anon. Prod. F. Bayer et Cie. Fr. Pat. 341,867, April 2, 1904. XLII. A., page 906.

Anthraquinone Derivatives [Anthracene Dye stuffs]; Production of —. Soc. Anon. Prod. F. Bayer et Cie. Fr. Pat. 342,195, April 11, 1904. Under Internat. Conv., Nov. 26, 1903.

ON treating alizarin with fuming sulphuric acid or with a mixture of anhydrous sulphuric acid and boric acid, and saponifying the resulting sulphuric ether, the hitherto unknown 1.2.5-trihydroxyanthraquinone is obtained. It dyes cotton mordanted with alum pure bluish-red shades, and gives violet-blue shades on chrome-mordanted cotton.

—T. F. B.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

Silk Mordanting. C. Knapstein. Färber-Zeit., 1904, 15, 248–250.

THE paper is a polemical one, and adduces sundry cases in which P. Heermann's work on the various theories of the mordanting process (see this J., 1904, 820) does not agree with facts observed in actual dyeing practice.—T. F. B.

Tannic and Gallic Acids; Determination of —. W. P. Dreaper. XXIII., page 913.

ENGLISH PATENTS.

Dressing Material; Method of Producing a Consistent Dust-free Surgical —. E. M. Sello, London. Eng. Pat. 15,276, July 8, 1904.

THE "fleece" material is passed, directly it comes from the carding machine, between heated rollers, the stearic acid adhering to the material being thereby melted, and imparting a gloss to the material.—T. F. B.

Woollen Fabrics and other Fibres or Materials adapted to be Felted; Fulling of —. H. J. Haddan, London. From A. Elosegui, Tolosa, Spain. Eng. Pat. 13,090, June 9, 1904.

WOOLLEN fabrics or other materials suitable for felting are exposed to the mechanical action of compression, either by passing between cylinders or by stamping, the fabric being heated at the same time by hot water or steam. The usual treatment with alkali, acid, soap, &c., is omitted.—T. F. B.

Mercerising Yarn; Apparatus for —. W. P. Thompson, London. From A. Wyser, Aarau, Switzerland. Eng. Pat. 22,189, Oct. 14, 1903.

A STAND is fixed on the edge of the mercerising tank on which the reel is placed after mercerising, to allow it to

drain. Two washing tanks are provided for each mercerising tank; these have perforated tubes arranged inside them, which project a spray of washing liquid on to the fabric. The yarn reels are driven by an adjustable change-gear, so that the reels may be rotated alternately in opposite directions, thus preventing tangling of the under threads of the yarn.—T. F. B.

Dyeing Apparatus. E. W. Beutner, Neukirchen, Germany. Eng. Pat. 22,869, Oct. 23, 1903.

Two vertical cylindrical tanks, communicating with one another by means of a short pipe fixed near the top of each, are divided horizontally into compartments by means of perforated plates or sieves, on which the goods to be dyed rest. The dyeing liquid is introduced into the bottoms of the tanks through branch pipes leading from a main pipe, which latter is provided with a three-way cock and a rotary pump, so that the liquid can be introduced into each of the tanks alternately. By this means, as the liquid comes in contact with the goods on the sieves alternately from above and below, more even dyeing results.—T. F. B.

Dyeing Silk a Blue-Black Colour after the same is Weighted; Process for —. J. A. Knup, Paterson, N.J., U.S.A. Eng. Pat. 6728, March 19, 1904.

SILK is weighted by successive immersions in solutions of stannic chloride, alkali phosphate, and alkali silicate; the various strengths of solution and methods of working for weighting to definite degrees are specified. The silk is then immersed in a solution of "Iron liquor" (iron dissolved in crude acetic acid) of 40° B. at 60° F. for one hour, and then in a solution of 100 lb. of gambier, 20 lb. of logwood extract, and 40 lb. of fustic extract (for each 100 lb. of silk) at 160° F. for two hours. After washing, the silk is finally treated with a solution containing 20 lb. of logwood extract and 50 lb. of soap per 100 lb. of silk, the temperature being raised from 110° F. at the start to about 150° F., the treatment being continued until the desired shade is produced, after which the material is finished as usual.—T. F. B.

Waterproofing Fabrics; Apparatus for —. T. F. Wiley, Harrogate, Yorks. Eng. Pat. 7172, March 25, 1904.

THE apparatus is of the type in which the waterproofing agent is applied to the fabric in the form of spray. In order to ensure a uniform discharge of liquid, a hollow float is mounted in a tank or vessel containing the waterproofing liquid, the tubes which convey the liquid to the fabric passing diametrically through this float. Air outlets are provided behind or below the fabric, to prevent uneven air currents in the waterproofing chamber.—T. F. B.

UNITED STATES PATENTS.

Impregnating Fabrics with Fluid Substances; Machine for —. H. A. Mann, Albany, N.Y. U.S. Pat. 768,059, Aug. 23, 1904.

Two cylinders, between which the fabric passes, are provided with rubber coatings which extend beyond the ends of the cylinders, and are mounted on a suitable framework, the axis of the upper cylinder being rearward of that of the lower one. Side walls of glass abut against the projecting rubber facings without touching the ends of the cylinders. The cylinders are rotated by suitable mechanism, the journal ends of one of the shafts being supported in stationary bearings, and the journal ends of the other in adjustable bearings. The fluid substance is contained in a receptacle above the upper cylinder, and is delivered by a suitable device on to the surface of the upper cylinder.—B. N.

Dyeing and Washing; Machine for —. C. Corron, Lyons, France. U.S. Pat. 768,425, Aug. 23, 1904.

SEE Fr. Pat. 319,049 of 1902; this J., 1902, 1533.—T. F. B.

FRENCH PATENTS.

Fibre from Gelatin; Production of an Artificial —. L. E. Jannin. Fr. Pat. 342,112, April 1, 1904.

A CONCENTRATED solution of gelatin (1 kilo.) in water (1 kilo.) and glycerin (100 grms.), containing, if desired, a small proportion (1–2 grms. per litre) of formaldehyde

and colouring matters, is forced, at a temperature of 80°–100° C., through spinnerets, as in the manufacture of artificial silk. The fibres thus produced are passed either into the air or into a solution of formaldehyde in alcohol or acetone, in order to harden them. They are then treated in a closed chamber with gaseous formaldehyde, to render the gelatin completely insoluble.—E. B.

Artificial Silk, Hair, and Straw; Manufacture of —. L. Crespin. Fr. Pat. 342,077, April 11, 1904.

NITROCELLULOSE is dissolved in a mixture of methyl and ethyl alcohols and ether, to which is added some castor or palm oil or glycerin. The collodion is forced through a capillary tube, the threads issuing from which being passed into a tube containing water, which dissolves nearly all the solvent from the collodion; this bath is constantly renewed, so that it always contains about 10 per cent. of alcohol. On distilling the wash water, the alcohol and nearly all the ether are recovered and can be used again.—A. B. S.

Woollen Fabrics in General; Manufacture [Fulling] of —. Soc. Reynes et Michel. Fr. Pat. 341,943, March 1, 1904.

IN order to avoid the loss in weight of woollen fabrics during fulling, the operations of scouring and fulling are performed simultaneously by immersing the fabric in a solution containing alkali and ammonia, "of suitable concentration and temperature," and then rapidly passing it between rollers, to cause the liquid to thoroughly impregnate the fibres.—T. F. B.

Removing Fatty Matters from Tissues [Wool Scouring]; Application of Electrolysis in —. J. M. J. Baudot. Fr. Pat. 342,108, April 1, 1904. ✓

WOOLLEN tissues are taken from a scouring machine without being washed, and are passed at full width through a tank in which positive and negative plates are fixed, a bath of sodium or potassium carbonate serving as electrolyte at starting. The fatty matters present in the tissues are, it is stated, readily saponified and removed. The soapy liquors obtained are run off into a separate tank and are electrolysed for the recovery of the fatty acids contained in them. The apparatus in which these operations are accomplished is especially intended for use in connection with the wool washing machine described in Fr. Pat. 331,956 (this J., 1903, 1192).—E. B.

Cop-tubes for Use in Dyeing, Bleaching, &c.; Improved —. J. Brandwood. Fr. Pat. 342,109, April 1, 1904.

THE cop-tubes in question are composed of woven or knitted materials.—E. B.

Blue and Blue-black Shades [on Wool] Fast to Light and Fulling; Production of —. Badische Anilin und Soda Fabrik. Fr. Pat. 342,026, April 8, 1904. Under Internat. Conv., March 11 and 18, 1904.

By dyeing chromed wool with substituted Acid Fuchsin mixed with certain azo dyestuffs susceptible to chroming, blue to blue-black shades are obtained, perfectly fast to light, fulling, washing, and acids. Suitable azo dyestuffs are those obtained by coupling diazotised di-*o*-diaminophenolsulphonic acid with 2 mols. of β -naphthol, or by coupling diazotised 1.2.4-naphthylaminedisulphonic acid with β -naphthol. (See Fr. Pat. 338,819 of 1903; this J., 1904, 820).—T. F. B.

Dyeing Silk a Blue-Black Colour after the same is Weighted; Process for —. J. A. Knup. Fr. Pat. 341,482, March 19, 1904.

SEE Eng. Pat. 6728 of 1904; preceding these.—T. F. B.

Stannic Oxide contained in the Wash Waters of Silk Dye-works; Plant for the Automatic Recovery of the —. R. Schmitz. Fr. Pat. 341,769, March 30, 1904. Under Internat. Conv., March 22, 1904.

THE washings containing stannic oxide are collected in a tank placed below the silk-washing apparatus, and are then pumped up into the separator, the rate of flow being

controlled by means of a perforated nozzle fixed on the end of the discharge tube. The separator consists of an upright cylindrical vessel with conical bottom: the upper part of this vessel is divided into two compartments by a plate extending about halfway down the vessel, whilst at the bottom of the cone (i.e., at the apex) is provided a conical cap, resting on feet fixed to the vessel. The stannic oxide falls to the bottom of the vessel, and is prevented by the cap from rising again in the vessel. When a sufficient deposit has collected, it is drawn off, and filtered through a press. The water, freed from the stannic oxide, overflows from the separating vessel by means of a pipe provided in the compartment not containing the inlet pipe.—T. F. B.

Fabrics printed with Metallic Powders; Process of Compression for —. O. Ostersetzer. Fr. Pat. 341,899, April 6, 1904.

To remove the metallic glitter, the materials are compressed with heated plates or cylinders the surfaces of which are finely engraved either with lines or dots.—A. B. S.

Printing of Fabrics. Soc. Anon. l'Art Industriel. Fr. Pat. 341,875, April 8, 1904.

THE dry colouring matters are made into a thick paste with boiled linseed oil, and this is thinned, according to the material to be printed, with a mixture of equal parts of heavy petroleum and ammonia. To this mixture is added some silicate of potassium solution containing about 30 grms. of sugar per litre. The colouring matter is fixed by the silicate which also combines with the sugar; the latter prevents the colour from being too brittle. The ammonia counteracts the smell of the linseed oil and petroleum and accelerates the drying of the colours.

—A. B. S.

VII.—ACIDS, ALKALIS, AND SALTS.

Carbon Dioxide and Soluble Nitrites; Reaction between —. R. B. Moore. J. Amer. Chem. Soc., 1904, 26, 959–961.

IN order to obtain conclusive evidence as to whether carbon dioxide does or does not liberate nitrous acid from a solution of potassium or sodium nitrite, the following experiments were made:—Three small bottles were filled with (a) distilled water, (b) and (c) concentrated potassium nitrite solution. Carbon dioxide was passed into (a) and (b), but not into (c) until the liquids were saturated, and a strip of iodised starch paper was suspended in each bottle $\frac{1}{2}$ in. above the liquid. After six minutes the paper in bottle (b) was quite blue, whilst the papers in the other two bottles remained unchanged, even after several hours. Similar experiments, using papers dipped in a solution of *m*-phenylenediamine hydrochloride and also others dipped in a solution of ferrous sulphate, gave confirmative results. On repeating the experiment with solutions of sodium nitrite and silver nitrite, instead of a solution of the potassium salt, similar results were obtained, proving that nitrous acid is also liberated from these nitrites by the action of carbon dioxide.—W. P. S.

Ferrous Salt Solutions; Oxidation of —. E. Jordis and H. Vierling. Z. Elektrochem., 1904, 10, 679–689.

THE differences in behaviour of solutions of ferrous ammonium sulphate, according to the method used to purify the salt, are ascribed in large measure to the slight variations in constitution of the salts obtained. The small electrical conductivity of a solution of the salt precipitated with alcohol is, however, chiefly due to the presence of alcohol which has adhered to the crystals. The oxidation of dilute solutions (1/1000 mol.) by means of oxygen was chiefly studied. Platinum was found to accelerate the oxidation, as also did an elevation of temperature. The precipitates obtained with and without platinum differed considerably in constitution and appearance. In the former case the precipitate was fine grained, bright yellow and insoluble in dilute acids, whereas in the latter it was coarser, of a red colour, and easily soluble. These observations agree with and extend those of Graham (Phil. Trans., 1861, 151, 208–219).—K. S. H.

ENGLISH PATENT.

Lead Dithionate; Making —. A. G. Betts, Troy, N.Y., U.S.A. Eng. Pat. 15,308, July 8, 1904.

SULPHUR dioxide gas is passed through water in which native manganese dioxide, in fine powder, is suspended. The necessary amount of lead dithionate is added to decompose any manganese sulphate which may have formed, and the solution of manganese dithionate is then treated with lead peroxide, to obtain lead dithionate in solution, and a precipitate of manganese dioxide.—E. S.

UNITED STATES PATENTS.

Sulphuric Acid Plant. A. Zanner, Brussels, Belgium. U.S. Pat. 768,108, Aug. 23, 1904.

THE plant includes a roasting furnace, Glover tower, and heating flue through which the gases pass to the tower, within which flue removable concentrating pans are set. These pans have an inlet supply pipe traversing the flue wall at the end near the tower, and are fed from without. A discharge pipe also extends through the wall at the end near the furnace. Vapour exit openings discharge into the flues. See also U.S. Pat. 693,635 of 1902; this J., 1902, 476.—E. S.

Carbonic Acid Gas; Manufacture of —. W. J. Knox, Assignor to G. Westinghouse, both of Pittsburg, Pa. U.S. Pat. 768,330, Aug. 23, 1904.

THE process consists in heating carbon dioxide gas, and passing it through carbonates or "carbonic-acid-containing substances," which then yield a further portion of the gas. A portion about equivalent to the portion thus added is withdrawn, and the remainder is reheated, and is passed continuously through the carbonates, &c., the evolution of the gas being increased by circulation of steam through the system.—E. S.

FRENCH PATENTS.

Lead Chambers [Sulphuric Acid]; Pulverisation of Water in —, by aid of the Gases of the Pyrites Furnace. R. Delplace. Fr. Pat. 342,117, Feb. 15, 1904.

THE furnace gases, after being cooled, and before entering the Glover tower, are passed through a column in which they are washed with strong sulphuric acid, in order to absorb any sulphuric anhydride present. The gases are then compressed, and admitted to a reservoir, whence they are supplied to the injectors. The injectors consist of J-shaped tubes into the long limbs of which the current of water enters. The mouths of the shorter limbs are covered by circular plates of greater diameter than the tubes, the plates being surmounted by small cones against the apices of which the gases are directed, through small orifices in the ends of vertical tubes arranged above the cones. Compare Fr. Pat. 333,585 of 1903; this J., 1903, 1292.—E. S.

Gas; Apparatus for the Absorption of Liquids by —, and especially for the Absorption of Hydrochloric Acid by Water. Vereinigte Thonwarenwerke Akt.-Ges. Fr. Pat. 342,008, March 18, 1904.

THE apparatus consists of a shallow rectangular closed box, the double bottom of which is separated as to the greater part of its length by a partition, which causes the water or liquid entering at one side aperture to traverse the length of the box before returning to emerge at a corresponding outflow aperture. A thin layer of liquid is thus presented to the gas which enters the top of the box by a vertical pipe at one end, and leaves by a corresponding pipe at the opposite end. A number of such boxes are connected in series, with arrangements for the circulation from box to box of both the absorbing liquid and the gas. The apparatus may be provided with cooling tubes.—E. S.

Hydrosulphites; Production of — Dry and quite Stable. Soc. Badische Anilin und Soda Fabrik. Fr. Pat. 341,718, March 28, 1904.

A HYDROSULPHITE, such as sodium or potassium hydrosulphite, or a hydrosulphite of zinc, or of zinc and sodium, or of potassium and ammonium, is heated in a reflux appa-

Cement Composition containing Magnesia, and Process for Making Artificial Stone therefrom. E. Bittel, G. J. Bittel, and G. K. N. Nutz. Fr. 341,989, March 7, 1904.

SEE U.S. Pat. 757,232 of 1904; this J., 1904, 491.—T. F. B.

X.—METALLURGY.

Gold-Copper and Gold-Silver Alloys; Specific Gravity of —. C. Hoitsema. Z. anorg. Chem., 1904, 41, 63–67.

THE author determined the specific gravity, at 15° C., of cast gold-copper and gold-silver alloys, in order to supplement the figures previously given by Matthiessen and Roberts-Austen. The results are given in the following tables:—

Gold-Silver Alloys.

Gold Content. Parts per 1000.	Specific Gravity.	Specific Volume.	
		Found.	Calculated.
(1000)	(19.26)	(0.05192)	..
917	18.08	0.05531	0.05555
*916	*18.041	0.05543	0.05500
*879	*17.54	0.05701	0.05722
843	16.06	0.05806	0.05922
*784	*16.354	0.06115	0.06137
750	16.03	0.06238	0.06286
687	15.07	0.06630	0.06651
*646	*14.87	0.06725	0.06741
583	14.24	0.07023	0.07017
500	13.60	0.07353	0.07381
*477	*13.432	0.07445	0.07461
417	13.00	0.07602	0.07744
333	12.38	0.08070	0.08112
*313	*12.267	0.08158	0.08190
250	11.78	0.08489	0.08475
*198	*11.760 ?	0.08504	0.08765
167	11.28	0.08861	0.08831
0	(10.4)	(0.09569)	..

* By Matthiessen. The figures for the alloy containing 198 parts of gold per 1000 are probably incorrect, perhaps owing to a printer's error.

Gold-Copper Alloys.

Gold Content. Parts per 1000.	Specific Gravity.	Specific Volume.	
		Found.	Calculated.
(1000)	(19.26)	(0.05192)	..
1980.1	18.84	..	..
1968.8	18.58	..	..
1958.8	18.36	..	..
1948.4	18.12	..	..
1938.6	17.93	..	..
1932.0	17.79	..	..
1922.8	17.57	..	..
917.0	17.35—	0.05764	0.05715
1900.5	17.17	..	..
1880.5	16.81	..	..
1861.4	16.48	..	..
833.0	15.96	0.06305	0.06244
750.0	14.74	0.06784	0.06768
583.0	12.69	0.07880	0.07820
250.0	10.035	0.09065	0.09619
0.0	(8.7)	(0.11404)	..

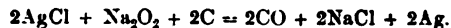
† By Roberts-Austen.

—A. S.

Silver; Simple Method for the Preparation of Metallic —. J. Thallwitz. Z. phys.-chem. Unterr., 1904, 17, 224. Chem. Centr., 1904, 2, 634.

FOR the rapid preparation of metallic silver from silver chloride, the author recommends the use of a mixture of powdered charcoal and sodium peroxide. A mixture of powdered wood charcoal and sodium peroxide is placed in an earthenware crucible, and is covered with a layer of the dry silver chloride. The whole is then carefully and intimately mixed. After a short time the mixture ignites spontaneously, and metallic silver separates in a reguline

condition. The proportions of the substances taken are calculated from the equation:



—A. S.

Purple of Cassius Test for Use in Cyanide Works [Determination of Gold]. A. Priester. XXIII., page 912.

Lead, Iron, Lime, Sulphur, Cadmium and Copper in Commercial Zinc Ores; Determination of —. W. S. Waring. XXIII., page 912.

ENGLISH PATENTS.

Cupola Furnaces for Melting Iron. J. Higham, Manchester. Eng. Pat. 22,308, Oct. 16, 1903.

THE invention relates to means for heating the blast of air introduced into the furnace. An air-belt in the form of an annular cylindrical chamber is arranged near the top of the furnace, in communication with a fan and with the tuyères by means of one annular passage or several longitudinal passages in the brickwork surrounding the furnace. A coiled pipe communicating with the fan and with the air belt may also be arranged in the chimney of the furnace.

—A. S.

Case Hardening; Process for —. G. C. Marks, London. From C. Lamargese, Rome. Eng. Pat. 25,986, Nov. 27, 1903.

SEE Fr. Pat. 332,199 of 1903; this J., 1904, 610.—T. F. B.

Furnaces especially adapted for the Separation of Gold and other Precious Metals from the Sweepings of Jewellers' Warehouses, Photographers' Waste, and the like. S. W. Price, London. Eng. Pat. 19,984, Sept. 16, 1903.

THE melting chamber, lined with refractory material, has its bottom inclined downwards from the front to the back, "the longitudinal centre line of the bottom being straight from end to end, but curving gradually up and round at the side and the lower part of the end, so as to be more or less elliptical in cross section, the roof being a continuation up and round, in similar elliptical form, of the bottom, the roof at the back end being curved gradually down, to receive and reflect back and down the flame from a burning jet of mineral oil, vapour or spray, injected through the opening in the front of the furnace." There are three exit openings for the products of combustion to the chimney; one from the furnace front, near the jet, another from the side of the curved top of the furnace near its back end, and the third from the same side as the second opening, but close to the front and as high up as possible. There is also an opening, having two branches at different heights, through the back wall of the furnace, for running off slag and metal separately.

—E. S.

Cadmium Alloy. G. Chaudoir, jun., Vienna. Eng. Pat. 21,854, Oct. 10, 1903.

SEE Fr. Pat. 335,838 of 1903; this J., 1904, 325.—T. F. B.

Metallic Alloy. F. W. Green, Wakefield, and T. Prescott, Huddersfield, Yorks. Eng. Pat. 22,073, Oct. 13, 1903.

THE alloy is prepared by melting from 70 to 90 parts by weight of aluminium, and adding successively 18 to 5 parts of magnesium and 12 to 2 parts of cadmium. The alloy is stated to be suited for ornamental work, bells, gongs, &c., and as a substitute for electro-plated ware.—E. S.

Metals, Alloys, Metallic Oxides and High Temperatures; Process for the Production of —. P. Weiller, Vienna, and A. Weiller, Trieste, Austria. Eng. Pat. 24,148, Nov. 6, 1903.

SEE Fr. Pat. 336,989 of 1903; this J., 1904, 445.—T. F. B.

Minerals; Concentration of —, from Ores. A. E. Cattermole, H. L. Sulman, and H. F. Kirkpatrick-Picard, London. Eng. Pat. 17,109, Aug. 6, 1903.

THE pulped ore is agitated with a soap solution and a mineral acid; the mineral particles become coated with the liberated fatty or resinous acid, and are separated from the

uncoated granules in a suitable classifying apparatus. The separation of such coated mineral particles may be facilitated by generating a gas, such as carbon dioxide, in the solution, by addition of an acid, and, if necessary, of a carbonate. The particles coated with fat, after separation, are washed with an alkaline solution, and the soap thus recovered is again used. Compare Eng. Pats. 26,295 and 26,296 of 1902, and 18,589 of 1903; this J., 1904, 118 and 256.—E. S.

Lead Ores; Process for Effecting the Desulphurisation of —. A. Savelsberg, Ramsbeck, Germany. Eng. Pat. 24,493, Nov. 11, 1903.

SEE Fr. Pat. 336,540 of 1903; this J., 1904, 376.—T. F. B.

Zinc and Lead, and generally all Metals whose Affinity for Sulphur is Inferior to that of Copper; Process for Extracting from their Sulphides —. A. H. Imbert, Grand Montrouge, France. Eng. Pat. 24,825, Nov. 14, 1903.

SEE Fr. Pat. 336,660 of 1903; this J., 1904, 376.—T. F. B.

Ore Pulverising Apparatus. E. H. Benjamin, Oakland, Cal., U.S.A. Eng. Pat. 13,743, June 17, 1904.

THE gyratory central vertical driving shaft of the apparatus rotates inside a guide pillar, arranged within an outer casing. The lower end of the shaft works on a ball-bearing, whilst between the upper portion and the guide pillar a "floating bearing" is interposed, controlled by a series of spring-held tension devices. Within the upper portion of the casing, and around the shaft a die ring is fixed. Within the space enclosed by the die ring the driving shaft carries two discs, on to the lower one of which the ore is fed, whilst the upper one prevents the ore being thrown back into the feeding chamber when the shaft is rotated. A series of guide shoes is interlocked to and between the discs, each shoe having a part radial groove terminating in an involute curve on its wearing face, and provided with a bore such that when the face of the shoe has become worn to a predetermined depth, an inrush of air occurs, resulting in a whistling sound, which calls the attention of the operator to the need for a new shoe.—E. S.

UNITED STATES PATENTS.

Open-Hearth Steel; Method of Producing —. H. Carlsson, Assignor to J. H. Le Fevre, both of Sydney, Canada. U.S. Pat. 768,265, Aug. 23, 1904.

THE character of the slag produced in the basic open-hearth process is controlled by the addition of titaniferous ore to the materials employed.—E. S.

Iron and Steel and their Alloys; Manufacture of —. J. B. de Alzugaray, Bromley, Kent. U.S. Pats. 768,551, 768,552, and 768,553, Aug. 23, 1904.

SEE Fr. Pat. 333,382 of 1903; this J., 1903, 1353.—T. F. B.

Zinc and other Sulphides from their Ores; Extracting —. G. D. Delprat, Broken Hill, N.S.W. U.S. Pat. 768,035, Aug. 23, 1904.

SEE Eng. Pat. 26,279 of 1902; this J., 1903, 912.—T. F. B.

Metal from Ores; Extraction of —. C. H. Webb, Dorking, Assignor to the Rapid Cyanide Treatment, Ltd., London. U.S. Pat. 768,319, Aug. 23, 1904.

SEE Fr. Pat. 340,238 of 1904; this J., 1904, 792.—T. F. B.

FRENCH PATENTS.

Blast Furnace Tuyère. E. Bertrand and E. Vorbach. Fr. Pat. 341,997, March 10, 1904.

SEE Eng. Pat. 26,037 of 1903; this J., 1904, 325.—T. F. B.

Vertical Furnace; Process and — for the Direct and Continuous Extraction of Metals, and especially for the Direct Production of Iron. O. Simmersbach. Fr. Pat. 341,788, March 31, 1904.

THE iron ore to be reduced is contained in a covered vertical furnace in the walls of which channels are cut from the

bottom up to a certain height, these channels being connected annularly and heated by gas burners at their bases. An exit for the products of combustion is provided at the top of the channels. The furnace, while thus heated entirely from its walls, without access of air or of fuel to its body, is traversed by carbon dioxide admitted into the mass of the charge near the bottom by suitable tubes, and aspirated from a discharge opening at the top. The gases discharged from the body of the furnace may be led away to feed the burners within the furnace walls. The reduced ore is withdrawn from the water-cooled iron base of the furnace, and may be then treated to obtain iron or steel in, for instance, a Martin's furnace.—E. S.

Steel Articles; Protecting certain portions of — during Cementation. A. De Dion and G. Bouton. Fr. Pat. 342,061, April 9, 1904.

THE parts of the piece of steel to be guarded against cementation are coated with a metallic deposit or with a salt which is not attacked by carbon.—E. S.

Nickel; Utilisation of the Waste produced in the Manufacture of —. M. Molon. Fr. Pat. 342,000, March 11, 1904. IX., page 901.

Metals; Process for the Extraction of —, the Formation of Alloys and Metallic Oxides, and the Production of High Temperatures. P. and A. Weiller. Addition, dated April 7, 1904, to Fr. Pat. 336,989, Nov. 9, 1903. See this J. 1904, 445.

THE powdered ore, freed as far as possible from gangue, is mixed with iron filings and saltpetre, with addition, in some cases, of a chlorate. The mixture is ignited in a small furnace, and the reduced and molten metal which sinks to the bottom is drawn off in the usual way.—E. S.

Metallic Alloy; Manufacture of a —. A. Jacobsen. Fr. Pat. 342,054, April 9, 1904.

TWO atomic proportions each of copper and of iron are fused with one atomic proportion each of aluminium and of nickel. The alloy is said to be suitable for the manufacture of cannon, of machines, ships, &c. A bronze is obtained by fusing together 6 parts by weight of the above-described alloy with 54 parts of copper and 40 parts of zinc. See Fr. Pat. 338,415 of 1903; this J., 1904, 610.—E. S.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(A.)—ELECTRO-CHEMISTRY.

ENGLISH PATENTS.

Batteries; Galvanic —. L. Fiedler and F. J. Gerard, London. Eng. Pat. 18,010, Aug. 20, 1903.

THE active portion of the cathode consists of an alloy of zinc and antimony, together with or without an amalgam of mercury and with or without other metals, such as manganese. The alloy may conveniently be in the form of a powder saturated with mercury, and contained in a tray, the electrolyte being in the form of a jelly.—B. N.

[*Electric Furnace*] *Processes for Heating Carbonaceous Material applicable for Chemical and other similar Processes.* Soc. Anon. l'Industrie Verrière et ses dérivés, Brussels. Eng. Pat. 5094, March 1, 1904. Under Internat. Conv., March 2, 1903.

SEE Fr. Pat. 340,846 of 1904; this J., 1904, 828.—T. F. B.

UNITED STATES PATENTS.

Furnace; Electric —. C. G. P. de Laval, Stockholm, Sweden. U.S. Pat. 768,054, Aug. 23, 1904.

THE furnace is cubical in form with a flat hearth, and has a horizontal feed opening in one wall extending inwardly. The electrodes pass through opposite walls, terminating in front of the feed opening, and between the latter and the electrodes is an escape opening in the roof of the chamber.

—B. N.

Connector for Electro-Chemical Apparatus. O. P. Fritchle, Denver, Colo. U.S. Pat. 768,175, Aug. 23, 1904.

THIS invention comprises a cup containing mercury, the cup being grooved externally, and furnished with a lower stem coated with tin and surrounded by a lug of cast lead, and a coupler of copper wire with a tinned body portion covered with a lead sheath cast on the copper. The end of the wire projects from the sheath, and is supported within, but out of contact with the cup, both cup and coupler end being coated with nickel. Near the end of the lead sheath is an annular groove, forming a bulb at the end, and an elastic sleeve of rubber encloses both cup and bulb end, so that when the coupler end is withdrawn, the perforated diaphragm in the elastic sleeve closes.—B. N.

Electrical Apparatus for Cleaning Gas. C. G. Hardie, Hamburg, N.Y. U.S. Pat. 768,450, Aug. 23, 1904.

THE gas is passed through an inclined casing, containing an electrode insulated throughout its length so as to prevent disruptive discharges between it and the casing. The electrode is connected to one of the secondary terminals of a high-potential transformer, the other terminal being connected to the bottom of the casing. Water is caused to flow uniformly over the bottom of the casing, to wash away the impurities deposited thereon under the influence of the electrical condenser.—H. B.

FRENCH PATENTS.

Electric Melting Furnace. Soc. Anon. l'Industrie Verrière et ses dérivés. Fr. Pat. 342,184, March 19, 1904. Under Internat. Conv., March 21, 1903.

See Eng. Pat. 5921 of 1904; this J., 1904, 550.—T. F. B.

Removing Fatty Matters from Tissues; Application of Electrolysis in —. J. M. J. Baudot. Fr. Pat. 342,108, April 1, 1904. V., page 899.

Lithopone; Manufacture of — by Electrolysis of Sodium Sulphate or Chloride with Simultaneous Production of Sodium Hydroxide. J. B. and A. Candau. Fr. Pat. 341,827, April 5, 1904.

SODIUM sulphate solution is electrolysed with zinc anodes in cells having porous partitions, the products in the anode and cathode compartments being respectively zinc sulphate and sodium hydroxide. The zinc sulphate solution is treated with solution of barium sulphide to obtain lithopone, a white precipitate composed of zinc sulphide and barium sulphate. If sodium sulphate be replaced by sodium chloride in the process, the zinc chloride obtained is mixed with a solution of sodium sulphate before precipitation by barium sulphide. Compare Fr. Pat. 338,322 of 1903; this J., 1904, 606.—E. S.

(B).—ELECTRO-METALLURGY.

Iron and Iron Alloys; Electro-thermal Production of —. B. Neumann. Stahl u. Eisen, 1904, 24, 682—688; 761—769; 821—826; 883—888; 944—950. See also this J., 1904, 258.

THE author reviews the different methods for the electrical production of iron and iron alloys. The subject-matter of the paper is given under the following headings and sub-headings:—*I. Processes and Apparatus.*—Processes of Ruthenberg, Stassano, Conley, Héroult, Keller, Harmet, Kjellin, and Gin; Girod's crucible furnace. *II. Nature of the Products.*—Examination of castings; examination of forged electro-steel. *III. Power Consumption and Thermal Efficiency.*—Production of pig-iron; conversion of pig-iron into steel. *IV. Costs.* *V. Comparison of the Electrical Production of Iron and Steel with the ordinary Metallurgical Processes.*—The author considers that in countries such as Germany, England, and the United States, which have large supplies of coal and have only impure iron ores to work with, electric processes cannot compete with the blast-furnace process in the production of pig-iron. In countries such as South America and New Zealand, however, which are deficient in mineral fuel, but in which pure iron ores and

sufficient cheap water-power are obtainable, the production of iron in the electric furnace can be carried out economically. With cheap electric energy, the production of iron alloys containing high percentages of silicon, chromium, tungsten, &c., may be made remunerative. The electric process for the manufacture of steel from pig-iron can also compete with the costly crucible process for the production of the finer kinds of steel.—A. S.

Electro-plating; Baths for —. A. Grésil. Monit. Scient., 1904, 18, 675—676.

THE nickel-plating bath recommended by Nannias (this J., 1904, 754) is considered to contain too little nickel; a very suitable bath contains 60 grms. of "ammoniacal nickel sulphate" and 40 grms. of crystallised nickel sulphate per litre. In silver-plating, the baths corresponding to the simple formula AgCN , 2KCN are not invariably the best; thus experience shows that, for silver-plating copper and its alloys, the most suitable bath contains 20 grms. of silver cyanide and 30 grms. of potassium cyanide per litre; whilst for tin and its alloys, 50 grms. of silver cyanide and 150 grms. of potassium cyanide per litre constitutes the best bath. As regards copper-plating, the formula given (*loc. cit.*) is considered too complex; excellent results are obtained with a bath consisting of copper sulphite, 20 grms.; potassium cyanide, 30 grms.; water, 1 litre.—T. F. B.

ENGLISH PATENTS.

Alkali Metals; Production of —. E. A. Ashcroft, Runcorn, Cheshire. Eng. Pat. 17,540, Aug. 14, 1908.

A SOLUTION of an alkali chloride is electrolysed over mercury, the latter forming an amalgam with the alkali metal. The amalgam is then used as the anode in an electrolytic cell containing an electrolyte capable of fusing and yielding alkali metal at a temperature below the volatilising point of mercury. A mixture of sodium and potassium hydroxides in about molecular proportions, which fuses at about 200°C ., may be used, or other mixtures of the alkalis or alkaline earths, or organic compounds of the alkali metals, such as sodium amide, may be used.—B. N.

Electro-deposition of Metals upon Aluminium. J. Creswick and H. Shaw, Sheffield. Eng. Pat. 21,609, Oct. 8, 1903.

METALLIC tin is first deposited upon the article by immersing it in a solution of stannous chloride and ammonium alum, prepared by dissolving 2 oz. of the former and 5 lb. of the latter in water. The plating is afterwards carried out in the usual way.—B. N.

FRENCH PATENT.

Electric Furnace intended for the Transformation of Cast Iron into Steel. G. H. Gin. Fr. Pat. 342,101, March 30, 1904.

THE furnace has a horizontal hearth of refractory material and is supported on wheels running on rails within a thick casing of non-conducting and heat-resisting material. The hearth is indented by a gutter extending from near the front to near the back, and repeatedly curved upon itself so as to form a series of connected parallel depressions, the two ends of which terminate opposite to one another at the front of the furnace. Each of the two termini to the gutter is formed within a massive block of steel, hollowed in its lower part and cooled by a current of water, and the blocks are constituted the poles to a source of electricity. A funnel of refractory material is set in the roof of the casing of the furnace, immediately above each terminus, through which molten cast iron is introduced so as to flow throughout the entire length of the gutter, giving the resistance to the current necessary for obtaining the temperature required for effecting the purification of the metal and its conversion into steel. Channels are provided at the exit end of the furnace converging from the end loops of the gutter towards a receptacle for receiving the outflow of metal. Scrap iron may be added to the charge, and means are described for making other additions, and for rabbling, &c. Compare Fr. Pat. 340,413 of 1904; this J., 1904, 732.—E. S.

XII.—FATTY OILS, FATS, WAXES, AND SOAP.

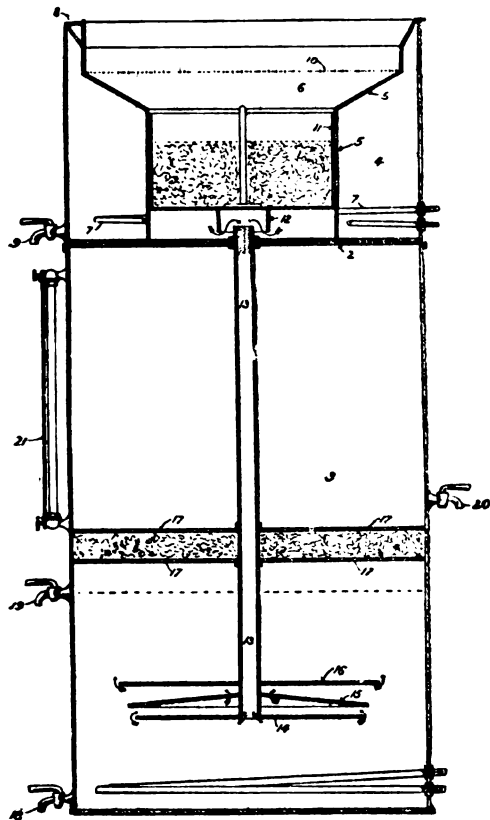
Saponification Process; Theory of the — L. Balbiano. *Gaz. chim. ital.*, 1904, 34, 55–56. *Chem. Centr.*, 1904, 2, 674.

THE facts that: (1) oleic acid when heated in the air is oxidised and then gives an acetyl value; (2) the esters of the fatty acids of linseed oil readily oxidise and give acetyl values; (3) the oxidised oils yield triglycerides of fatty acids; and (4) in the residue after the partial saponification of the triglyceride of benzoic acid, only the triglyceride is present, lead the author to believe that the increased acetyl value of the residue after the partial saponification of fatty acids observed by Lewkowitsch, is due to the formation of triglycerides of hydroxy acids and not, as the latter considers, to the formation of di- and mono-glycerides. (Compare Lewkowitsch, this J., 1898, 1107; 1899, 1031; 1900, 74, 254.)—A. S.

ENGLISH PATENTS.

Filtering and Washing [Lubricating] Oils; Apparatus for — C. W. Brown, London. From W. F. Warden, Akron, Ohio, U.S.A. *Eng. Pat.* 14,216, June 23, 1904.

A TANK (see figure) is divided by a partition, 2, into two compartments, 3 and 4, the upper one containing an inner chamber, 6, into which is fitted a vessel, 11, containing cotton waste. Water is circulated through the compartment, 4, and heated by the coil, 7. The oil, which is supplied to the chamber, 6, passes first through the wire



gauze, 10, then through the cotton waste and perforated bottom of vessel, 11, and overflows through the pipe, 13, into the lower compartment, 3. The deflecting plates, 14, 15, and 16, cause the oil to travel as indicated by the arrows, the conical plate, 13, being perforated near its centre, and every particle of oil is thus subjected to the washing action of the water, which is contained in 3 up to

the level of the tap, 19. Before being withdrawn through the tap, 20, the oil finally passes through more cotton waste between the perforated plates, 17.—B. N.

Garbage or Offal; Process of Cooking — and Removing the Oil or Melted Grease therefrom. C. S. Wheelwright and J. T. Fiske, jun. *Eng. Pat.* 15,235, July 7, 1904. XVIII. B., page 909.

Detergent and other Preparations for Toilet Use [Soap with Lemon Juice]; Manufacture of —. G. Giraudet, Paris, and A. Neuberger, London. *Eng. Pat.* 18,247, Aug. 24, 1908.

SEE *Fr. Pat.* 334,916 of 1903; this J., 1904, 121.—T. F. B.

FRENCH PATENTS.

Removing Fatty Matters from Tissues; Application of Electrolysis in —. J. M. J. Baudot. *Fr. Pat.* 342,108, April 1, 1904. V., page 899.

Fatty Materials of any kind; Apparatus for the Deglycerination of —. G. Col. First Addition, dated March 28, 1904, to *Fr. Pat.* 340,521, Feb. 17, 1904 (see this J., 1904, 872).

A FORM of apparatus is described which can be worked both continuously and intermittently. The fatty material is fed into a conical drum in which it traverses successively a series of plates and then runs through a series of superposed horizontal cylinders. In its passage over the plates in the conical vessel, it is mixed with steam under pressure, and steam is also supplied to the horizontal cylinders, which are furnished with rapidly moving stirring arms. This apparatus discharges the material to one of two cylindrical "saturating collectors," which are likewise provided with slowly moving stirring arms and steam under pressure. Whilst one collector is being filled, the other is being discharged, and the operation is thus made continuous.

—J. F. B.

Cellulose from Green Alfa [Esparto]; Preparation of — [and Manufacture of Soap from By-Product]. P. Boutry and A. Deiss. *Fr. Pat.* 341,930, Feb. 16, 1904. XIX., page 909.

Soap; Apparatus for Rapidly Cooling Liquid —. R. Roth. *Fr. Pat.* 341,731, March 29, 1904.

THE hot liquid soap is filled into a closed reservoir or tank. Below the latter are a number of vertical tubes surrounded by cold water. The liquid soap fills the tubes, where it is cooled and solidified. The solid bars are removed from the tubes by forcing air into the closed tank, a fresh supply of liquid soap being caused to pass into the tubes. At the commencement of the operation the lower ends of the tubes are closed by a sliding plate.—W. P. S.

Rosin Soap for Sizing Paper and Millboard; Manufacture of —. A. Sauvage. *Fr. Pat.* 341,844, April 6, 1904. XIX., page 910.

Soap [containing Benzene]; Manufacture of a Liquid Sanitary —. L. Jodoche. *Fr. Pat.* 342,033, April 8, 1904.

19 KILOS. of rosin are dissolved in 57 kilos. of warm benzene, 24 kilos. of potassium hydroxide solution (sp. gr. 1.10) are then added, and the mixture is stirred for 15 minutes. The quantities of rosin and potassium hydroxide may be varied, and the benzene may be replaced by another solvent, such as "essence."—W. P. S.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(A.)—PIGMENTS, PAINTS.

ENGLISH PATENTS.

Paint; Preparation of Zinc for use as —, and Apparatus therefor. M. Malzac, Paris. *Eng. Pat.* 17,895, Aug. 18, 1903.

SEE Addition, of June 29, 1903, to *Fr. Pat.* 329,079 of 1903; this J., 1903, 1357.—T. F. B.

Colour Lakes [from Azo Dyestuffs]; Manufacture of —. H. F. Newton, London. From Farbenfabr. vorm. F. Bayer and Co., Elberfeld, Germany. Eng. Pat. 22,856, Oct. 22, 1903.

SEE Fr. Pat. 336,438 of 1903; this J., 1904, 368.—T. F. B.

FRENCH PATENTS.

Lakes [from Azo Dyestuffs]; Process for Preparing —. Soc. Anon. Prod. F. Bayer et Cie. Fr. Pat. 341,867, April 2, 1904.

RED lakes, fast to light, are obtained by precipitating, on a suitable substratum, the dyestuff obtained by coupling the diazo compound of 1-naphthylamine-3.8-disulphonic acid with β -naphthol.—T. F. B.

White Lead; Non-poisonous —. H. and L. Dodé. Fr. Pat. 341,870, April 2, 1904.

LEAD oxide is heated with about 25 per cent. of its weight of kaolin, sand, or other siliceous substance, to 700° or 800° C. When cold, the mass is pulverised and made into pigments in the same way as white lead. Such pigments are non-poisonous, and do not blacken on exposure to bad air.—T. F. B.

Lithopone Manufacture of —, by Electrolysis of Sodium Sulphate or Chloride, with Simultaneous Production of Sodium Hydroxide. J. B. and A. Candau. Fr. Pat. 341,827, April 5, 1904. XI. A., page 904.

(B).—RESINS, VARNISHES.

Turpentine; Technical Analysis of Spirits of —, with a New Method for the Detection of Petroleum Adulterations and Wood Spirits of Turpentine. J. M. McCandless. XXIII., page 913.

ENGLISH PATENTS.

Linoleum of Multiple Layers; Manufacture of —, and Apparatus therefor. W. P. Thompson, London. From Bremer Linoleumwerke Delmenhorst, Delmenhorst, Germany. Eng. Pat. 17,780, Aug. 17, 1903.

SEE Fr. Pat. 384,635 of 1903; this J., 1904, 69.—T. F. B.

Linoleum or the like; Manufacture of —. L. W. Seeser, Raguha, Germany. Eng. Pat. 17,971, Aug. 19, 1903.

THE linoleum mass is passed between rollers, together with two layers of fabric instead of only one. The stretching of the whole under the rollers, and the consequent irregularities due to shrinkage, are thus much diminished. The additional layer of fabric, the use of which forms the main feature of the patent, may be applied to the same side as the usual layer and afterwards stripped off, leaving the inner layer firmly imbedded, or to the opposite side in a subsequent operation, when by reversing the whole and removing the first layer, inlaid linoleum can be produced on the rolls themselves.—R. L. J.

(C).—INDIA-RUBBER, &c.

Castilloa: its Description, Yield, and a Method of Preparing Rubber from its Latex. C. O. Weber. India-Rubber J., 1904, 28, 228–230.

THERE are at least three varieties of *Castilloa*:—*C. alba*, the hardiest, which yields a large quantity of rubber and suffers little from the tapping operation; *C. negra*, yielding good rubber, but which easily bleeds to death; and *C. rubra*, which produces a good rubber, but in very small quantities. Cultivation of the *Castilloa* in Colombia should prove very remunerative, since land, at any rate in territories adjoining the isthmus, is to be had for practically nothing, and labour is cheap. In fact, the cost of clearing the land and attending to the plantation for seven years does not exceed 25¢ per 1,000 trees. If the trees are tapped at the end of the seventh year and yield only $\frac{1}{2}$ lb. per tree, then, after deducting all expenses, a return of about 100 per cent. would be made in the eighth year, and with careful management this would increase for some years. The trees should not be tapped until they are at least eight years old, as the

rubber from young trees contains a large percentage of resin, as is shown by the following figures:—Two years old, 42.33; three years old, 35.02; four years old, 26.47; five years old, 18.18; seven years old, 11.59; eight years old, 7.21 per cent. By the following process it is stated that a purer and stronger product can be obtained from the *Castilloa* than the finest brands of commercial Para:—The crude latex is diluted with five times its volume of water (in some cases boiling water being preferable), strained through cotton gauze, and formaldehyde added in the proportion of about 8 oz. to a barrel of the diluted latex: the whole is then well stirred and allowed to stand for 24 hours. The formaldehyde prevents coagulation of the albumin, and the rubber collects on the surface of the liquid in the form of a snow-white cake, which can be lifted out in one mass. Every trace of albuminous matter can then be removed in an ordinary washing machine. The analysis of a sample sheet of rubber so prepared, gave the following figures:—Resinous matter, 2.61; ash, 0.44 per cent.; nitrogenous constituents, nil; insoluble matter, nil.—J. K. B.

ENGLISH PATENT.

Rubber Solutions or Compounds. Isidor Frankenburg, Ltd., R. J. Frankenburg, and F. H. Betteridge, Salford, Lancs. Eng. Pat. 17,156, Aug. 7, 1903.

MORE or less unflammable solutions are obtained by dissolving rubber in one or more of the following solvents:—Carbon tetrachloride, dichloromethane, trichloro-ethane, tetrachloro-ethane, or trichlorobenzene. The rubber may also be softened with coal-tar naphtha or other ordinary solvent, and then one of the above solvents added until the desired consistency is obtained.—T. F. B.

UNITED STATES PATENT.

Wurtzilite [Rubber Substitute]; Process of Treating and Dissolving —. F. M. Whitall, Assignor to S. K. Whitall and J. R. Edson, Washington, D.C. U.S. Pat. 768,101, Aug. 23, 1904.

WURTZILITE (see this J., 1903, 1139) in a finely-divided or pulverised condition is dissolved in "dead-oil" by the aid of heat; the solvent is then removed until the mass becomes consistent.—J. F. B.

XIV.—TANNING; LEATHER, GLUE, SIZE.

Tannic and Gallic Acids; Determination of —. W. P. Dreaper. XXIII., page 913.

ENGLISH PATENT.

Leather; Artificial — and its Method of Manufacture. R. Piesbergen, Berlin. Eng. Pat. 15,629, July 13, 1904.

A PLASTIC compound which sets hard when cold, composed of tanned animal albumin, glycerin, fatty oils, india-rubber solution and filling material is enclosed in a collodion film and gently pressed or rolled to the desired shape.—R. L. J.

UNITED STATES PATENT.

Skins or Hides; Process of Treating Pickled or Tanned —. O. P. Amend, New York. U.S. Pat. 768,959, Aug. 23, 1904.

PICKLED skins and leather are de-acidified and oxidised by treatment in a neutral or slightly alkaline solution of a nitrite of an alkali or alkaline earth, such as sodium nitrite.—J. F. B.

XV.—MANURES, Etc.

Phosphates; Action of Water and Saline Solutions upon certain Slightly Soluble —. F. K. Cameron and L. A. Hurst. J. Amer. Chem. Soc., 1904, 26, 885–913.

THE phosphates of iron, aluminium, and calcium are all hydrolysed by water, and the solutions always contain free phosphoric acid. It is therefore more correct to speak of the resulting solutions as solutions of the decomposition products, the phosphates themselves being, in many cases, present in negligible quantities only. The reaction follows

the law of mass to some extent, is a slow one, and is markedly affected by the temperature. The conclusions arrived at after a considerable number of experiments are as follows:—Whilst the free acid tends to increase the solubility of the phosphate, the base, though in solution in smaller amount, exerts a greater effect in decreasing it. Successive additions of water, therefore, cause relatively less solution and decomposition of the phosphate. Potassium chloride decreases the amount of phosphoric acid entering into solution from iron, aluminium, or calcium phosphate, but increases the amount of base. Potassium sulphate increases the amount of soluble acidity in the case of iron phosphate, but decreases the amount entering into solution from aluminium phosphate. The presence of sodium nitrite decreases the acidity obtained from iron or aluminium phosphate, but appears to slightly increase the amount yielded by calcium phosphate. No correlation of the acidity with the amounts of iron in the solution seems possible. A rise of temperature accelerates the decomposition of the solid phosphates in either water or saline solutions.—W. P. S.

ENGLISH PATENT.

Manure; New and Useful Process of Manufacturing an Artificial — W. Mathesius, Berlin. Eng. Pat. 13,861, June 13, 1904. Under Internat. Conv., June 13, 1903.

MINERAL phosphates, such as phosphorites, &c., are mixed with lime to form a "tetrabasic phosphate of calcium," if sufficient lime is not already present, and are melted in, for instance, a cupola furnace. The molten slag is treated with steam under pressure, or, in case an adequate excess of lime is present, with exhaust steam, in a closed vessel, until the product crumbles to a dry powder.—E. S.

XVI.—SUGAR, STARCH, GUM, Etc.

UNITED STATES PATENT.

Syrup; Process for Purifying — M. Kowalski, Warsaw. U.S. Pat. 768,130, Aug. 23, 1904.

SEE Addition, of May 23, 1902, to Fr. Pat. 315,737 of 1901; this J., 1903, 221.—T. F. B.

FRENCH PATENT.

Saccharine Juices; Process of Defecation of — Vve. H. Breyer (née Mitterbacher) and A. J. de Wehrstedt. Fr. Pat. 342,159, April 2, 1904.

PULVERULENT, inert materials, such as pounded brick, are mixed with lime and employed for the defecation of saccharine juices. It is stated that such materials permit of a considerable economy in the quantity of lime required and that they absorb colouring matters and impurities from the juice and assist filtration.—J. F. B.

XVII.—BREWING, WINES, SPIRITS, Etc.

Malt Analysis; Fermentation Experiments as an Aid to — A. Schifferer. Z. ges. Brauw., 1904, 27, 585—587.

To obtain evidence of the behaviour of a malt in the brewery, the mixed wort which has been employed for extract determinations by mashing the coarse and fine grist is boiled for a short time in an Erlenmeyer flask, cooled to 17.5° C., and its specific gravity determined. Three clean, dry, white beer bottles, 340—360 c.c. capacity, are one-third filled with the wort, closed, and kept in the steriliser for half an hour at 55°—58° C. After cooling, two of the bottles are each pitched in the sterile chamber with 1 gm. of the freshly washed, dry-pressed brewery yeast, and, after closing with a sterile cotton-wool plug, placed in a thermostat at 25° C. The third bottle, which is also kept in the thermostat until the fermentation in the other two bottles is at an end, serves as a control. In the author's experiments these blanks gave either zero or negligible results, so that no corrections were needful. Of the two bottles pitched with yeast, one is removed from the thermostat after 72 hours,

and the specific gravity of the beer determined at 17.5° C., after removal of the carbon dioxide and filtration. The other fermented wort is treated in the same way after a further 24 hours, by which time the fermentation is complete. The relation between the results thus obtained and those of the tun beers are shown in the following table:—

	Apparent Final Attenuation.	
	Experimental Wort.	Tun Beer.
	Per Cent.	Per Cent.
Pilsen malt.....	82.0	78.4
Pale lager beer malt, No. I.	77.0	73.5
" " " No. II.	76.3	72.0
Dark " " No. I.	72.5	64.5
" " " No. II.	70.5	63.1

The higher percentage of matter fermented in the laboratory experiments as compared with the brewery mashers is explained by the more favourable conditions for starch degradation obtaining in the former case, the decoction process of mashing involving much destruction of diastase.

—T. H. P.

Yeast Oxydase. W. Issajew and S. Kalliski. Z. physiol. Chem., 1904, 42, 133—140; Chem. Centr., 1904, 2, 663.

THE authors have detected an oxidising enzyme in extracts of yeast prepared with water and glycerin. The action of the enzyme is frequently masked by that of a reductase, but the latter can be rendered inactive by previous oxidation with atmospheric oxygen. The oxidising action of the enzyme can be proved both on the normal constituents of the yeast and on added polyphenols (quinol, pyrogallol). Top-fermentation yeast is appreciably richer in this oxidising enzyme than is bottom-fermentation yeast.—A. S.

Invertase of Yeast. B. Hafner. Z. physiol. Chem., 1904, 42, 1—34. Chem. Centr., 1904, 2, 603.

By dialysis of different specimens of invertase, the author found that the ash-content could be considerably reduced, but could never be brought quite to zero; this is especially the case with regard to the phosphorus, which, as Salkowski (Z. physiol. Chem., 31, 321) has stated, is in organic combination. All attempts to obtain invertase free from carbohydrates failed. (Compare Wróblewski, this J., 1898, 682.) Invertase is not an albuminoid body, as it is not acted upon by proteolytic enzymes, and does not give the biuret reaction. It, however, contains nitrogen, and is possibly a complex phosphoric acid derivative, in which hydroxyl groups have been replaced by carbohydrates and nitrogenous substances. Invertase prepared from brewers' yeast is, in general, more active than that prepared from pressed yeast, but the latter preparations are of more constant composition.—A. S.

English Beer Types; Preparation of — H. Seyffert. Woch. f. Brau., 1904, 21, 519—520.

WITH reference to the discovery by Claussen (this J., 1904, 721) of the so-called *Brettanomyces*, torula which produce the characteristic flavour of English beers, the author describes his own experience in a Russian brewery, preparing top-fermentation ales and porters with single-cell yeast. It was found that genuine English porter always contained a large proportion of wild yeasts and bacteria, whereas the Russian porter was free from infection, but lacked the typical "English" flavour. Experiments showed that when the Russian porter was infected with some of the cask-sediment from the English, the desired aroma was readily developed in it. The constituent organisms of this cask-sediment, some of them closely resembling Claussen's *Brettanomyces*, were isolated and cultivated in the pure state. Amongst them was a peculiar yeast which was capable of conducting the entire fermentation of the porter-wort, with the production of an "English" aroma. But difficulties were encountered in separating the yeast from the beer, and after a few fermentations the yeast had changed its character and had lost its property of

developing the "English" aroma. None of the isolated organisms were capable of giving such a good flavour as the original mixed cask-sediment, but here again, when it was attempted to transfer the sediment from one brewing to the next, alteration or degeneration gradually took place, and the desired effect was lost. Similar results, successful at first, but failing after continued use, attended all attempts to obtain the "English" flavour by means of imported organisms, whether pure or mixed. The author suggests that the property claimed by Claussen for his *Brettanomyces* may also not be of a specific character, but merely a temporary property, which will disappear under different conditions of sub-cultivation, in the same manner as in the cases cited above.—J. F. B.

Beer; Sulphur Dioxide in — G. Graf. Z. ges. Brauw., 1904, 27, 617—620.

THE author's experiments confirm the assumption of Pfeifer (this J., 1889, 995) that the formation of sulphur dioxide in fermenting liquids is the result of a physiological process based on racial peculiarities of the yeast, and depending on the environment. The chief practical inference is that sulphur dioxide is a normal constituent of beer, and that its presence in excess of the usual limit (57 mgrms. per litre) should not be regarded as conclusive evidence of the use of sulphites or the like.—C. S.

Wine; Manufacture of — by Sulphuring and Fermenting the Grapes. A. Lacassagne. J. d'Agric. Pract., 1903, 412—416; through Bied. Centralbl., 1904, 33, 639—640.

EXPERIMENTS were made on the large scale by exposing the grapes to the vapours of sulphurous acid in order to kill the foreign organisms whilst acclimatising the yeast to sulphurous acid. In addition to this treatment, "potassium persulphate" was added to the juice to the extent of 40 grms. per hectolitre. The fermenting must showed a preponderance of *S. ellipsoideus*, whilst *S. apiculatus* was absent. The above treatment, when applied to sound grapes, had a slight but distinct favourable influence on the course and the final result of fermentation; the last residues of sugar were fermented in a shorter time. The treatment had no appreciable effect upon the chemical composition of the wine, nor upon its colour, flavour, &c. The value of the wine was in no way impaired. The sulphured wine was decidedly more resistant towards the attacks of foreign micro-organisms, and kept better when exposed to the air than wine prepared in the ordinary way.—J. F. B.

Spirit from Dried Potatoes; Manufacture of — G. Heinzelmann. Z. Spiritusind., 1904, 27, 358.

OWING to poor harvests, the use of potatoes preserved by drying as raw material for the manufacture of spirit has not made much progress in the last two years, since the cost of the potatoes has been too high. Dried potatoes require the same treatment during steaming as maize, i.e. the Henze steaming apparatus should be provided with stirrers; otherwise the potatoes clog together and form a mass impenetrable to the action of the steam, and gelatinisation is incomplete. If a stirrer be not available it is necessary to employ rather more water for the steaming, in order to ensure the necessary mobility. For the reason just mentioned, it has not been found practicable to steam a mixture of fresh and dried potatoes simultaneously, with the object of increasing the concentration of the mash. In thick-mash distilleries 100 kilos. of dried potatoes have yielded 33—35 litres of absolute alcohol, according to their richness in starch. Dried potatoes occur in the market in two forms: dried slices, which are prepared by drying slices of raw potatoes in a current of hot-air; and flaked potatoes, which are made by passing boiled potatoes between hot rollers. The slices require steaming under pressure in the Henze apparatus. The flakes, manufactured originally for food purposes, are much dearer than the slices; they do not require steaming, but are mashed with water and malt at 60° C. If potatoes at harvest time show any signs of disease or any indications that they will not keep well over the winter, it is strongly recommended that, wherever practicable, they should be dried.—J. F. B.

FRENCH PATENTS.

"Lecithinated Beer": Incorporation of the Active Constituents of Lecithin with Acid, Alcoholic, and other Beverages. A. Fournier. Fr. Pat. 342,007, March 17, 1904.

THE active constituents of lecithin, viz. choline and glycerophosphoric acid, may be isolated for the purpose of mixing with beverages in two ways: (1) by the hydrolysis of lecithin with hydrochloric acid and neutralisation of the solution with sodium bicarbonate, and (2) by boiling the alcoholic solution of lecithin with glycerophosphoric acid. In the first case the solution ultimately isolated for use contains choline hydrochloride and sodium glycerophosphate, and in the second case the product is a solution of choline glycerophosphate. In either case the final solution is brought to a standard concentration, and adjusted to the same degree of acidity and alcoholic strength as the beverage with which it is to be incorporated.—J. F. B.

Distillery; System of — adapted for Agricultural Use. L. P. Bazin. Fr. Pat. 341,983, Feb. 25, 1904.

IN order to continue the working of the distillery all the year round, a sufficient number of cylindrical silos are constructed of masonry below the level of the ground. The roots, &c. are washed and sliced, and the slices are stored in the silo-pits, in regular horizontal layers, care being taken to pack them closely, with exclusion of air spaces. When required for use, the slices are removed layer by layer, and extracted systematically by boiling water. The wort is acidified, and fermented by yeast.—J. F. B.

Brandies and Liquors; Use of Roasted Wood for Improving and Ageing — J. L. Rouméguière. Fr. Pat. 342,123, March 10, 1904.

THE wood is first roasted in order to render the principles, which play a part in the improvement and ageing of brandy, immediately soluble in the liquor.—J. F. B.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(A.)—FOODS.

Flour; Preservation of — by Cold. Balland. Comptes rend., 1904, 139, 473—475.

SAMPLES of flour were stored for three years in a receptacle at the ordinary temperature, and in an apparatus kept at a temperature between +2° and -2° C. The flour preserved at ordinary temperatures was slightly bleached after storing, and was bitter, and useless for food, whilst the gluten obtainable from it was in clots, inelastic, and contained 64.5 per cent. of water; the amount obtained by extraction with ether was from 3 to 6 per cent. less than that obtained from the original flour; the acidity had also increased. The sample preserved in the cold was rather damp and tasteless, but this was due to the presence of moisture in the apparatus; the amount of gluten obtainable was slightly greater than that from the original sample, whilst, as regards quality, it was homogeneous, sweet, and contained 71 per cent. of water; the fatty matter and acids were present in the same quantities as in the original flour.—T. F. B.

ENGLISH PATENT.

Albumen from Fish; Manufacture of — A. Foelsing, Offenbach a/Main, Germany. Eng. Pat. 19,017, Sept. 3, 1903.

THE fish, after the removal of the head and bones, is freed from grease by a suitable solvent, such as acetone, and then repeatedly extracted with a 1½ per cent. solution of sodium or potassium hydroxide, until all the albuminous matter is dissolved. The liquors are filtered, deodorised by addition of hydrogen peroxide (2 per 1000), and precipitated by sulphurous acid solution. The flocculent matter is washed till neutral, dried, and pulverised.—R. L. J.

FRENCH PATENT.

Milk Powder; Manufacture of a — J. Maggi.
Fr. Pat. 341,840, April 1, 1904.

The milk is intimately mixed and rendered homogeneous under pressure, then dried by the hot-roller system, and powdered.—W. P. S.

(B).—SANITATION; WATER PURIFICATION.

Nitrogen in Water; Determination of Ammoniacal and Protein — J. Effrout. XXIII., page 912.

Iron; Colorimetric Determination of Small Amounts of — by Acetylacetone [especially applicable to Water Analysis]. H. B. Palsifer. XXIII., page 913.

ENGLISH PATENTS.

Wash and other Waste Waters or Residues; Treatment of — A. J. Boulton, London. From A. E. Vasseux, Hal, Belgium. Eng. Pat. 17,661, Aug. 14, 1903.

SEE Fr. Pat. 330,423 of 1903; this J., 1903, 1099.—T. F. B.

Trade Effluents; Treatment of — J. Turner, Sowerby Bridge, Yorkshire. Eng. Pat. 20,021, Sept. 17, 1903.

Any common soap, such as rosin soap, or fats and alkali, are added, preferably in solution, to the trade effluent. After agitating the mixture, sulphuric acid, aluminium sulphate, or any suitable metallic salt, is added to "curd or crack the sud," after which the whole is allowed to stand for some time. The clear water may then be run off, the solid matters being precipitated. If necessary, the effluent may also be oxidised before or during the treatment by blowing air through it.—A. G. L.

Garbage; Apparatus for Removing Liquids from Solids, applicable for the Treatment of — and for other Purposes. C. S. Wheelwright, Bristol, R.I., and J. T. Fiske, jun., Burrillville, R.I. Eng. Pat. 14,484, June 27, 1904.

The apparatus consists of a cylinder placed at the lower end, and in connection with, a digester in which the material is previously treated with water. The cylinder is provided with a revolving screw fitting its internal periphery. Perforated plates are placed in the sides of the cylinder with suction boxes below them, and a pump is arranged in connection with the latter to return the water to the cylinder. Fins or plates are let into the cylinder, which vibrate to and from the interstices between the threads of the screw. One end of the cylinder projects beyond the screw, and is provided with an outlet and a head fitted with a valve on the axis of the screw at various distances from the latter, to direct the material from the screw to the outlet. (See also U.S. Pat. 719,541 of 1903; this J., 1903, 288.)—W. P. S.

Garbage or Offal; Process of Cooking — and Removing the Oil or Melted Grease therefrom. C. S. Wheelwright, Bristol, R.I., and J. T. Fiske, jun., Burrillville, R.I., U.S.A. Eng. Pat. 15,235, July 7, 1904.

STEAM is introduced under pressure directly into the mass of garbage or offal, together with sufficient fresh water to float the oil or grease extracted from the garbage. The water and extracted oil or grease are continuously trapped, whilst the solid parts of the garbage or offal are held back, and the water is finally separated from the oil or grease extracted.—A. G. L.

FRENCH PATENT.

Water Filter. N. A. Hérons, L. Mauclair, and E. Meyer.
Fr. Pat. 341,908, April 6, 1904.

The filter consists of a vertical cylindrical vessel having a tubulure at the top and bottom. A tube passes through the lower tubulure, the upper end of the tube being surrounded by a hollow block of compressed carbon which has previously been "stoved," soaked in a solution of ferric chloride containing 1 per cent. of vanadic chloride, and then in a solution of sodium hydroxide (4° B.) to which has been added 10 per cent. of hydrogen peroxide. This block of

carbon has around and above it a layer of granulated wood-charcoal also previously treated with ferri-vanadic chloride and sodium hydroxide. A packing of oxycellulose is placed above this layer, and the remaining space in the filter is filled with a mixture of powdered iron, containing 1 per cent. of vanadium, and corundum. Above this mixture is a second packing of oxycellulose. The water to be filtered enters through the upper tubulure.—W. P. S.

(C).—DISINFECTANTS.

UNITED STATES PATENTS.

Antiseptic Compound. A. M. Clover, Ann Arbor, Mich.
U.S. Pats. 768,561 and 768,563, Aug. 23, 1904.

SEE Eng. Pat. 8415 of 1904; this J., 1904, 934.—T. F. B.

Peroxide Acids; Process of Forming Organic — [Disinfectants.] A. M. Clover, Ann Arbor, Mich. U.S. Pat. 768,562, Aug. 23, 1904.

SEE Eng. Pat. 8415 of 1904; this J., 1904, 884.—T. F. B.

XIX.—PAPER, PASTEBOARD, Etc.

ENGLISH PATENT.

Celluloid and like Substances; Apparatus for the Treatment [Softening] of — H. W. Cave-Browne-Cave, London. Eng. Pat. 22,299, Oct. 16, 1903.

An air-tight box is fitted with a loose perforated bottom, beneath which wool or other absorbent material, moistened with a volatile solvent of celluloid, e.g., methylated spirit and camphor, amyl acetate, or methylated ether, is packed. The articles to be softened are placed in trays above the false bottom and exposed to the vapours for the necessary space of time.—R. L. J.

UNITED STATES PATENTS.

Paper-making Machine. E. Waite, Franklin, Mass.
U.S. Pat. 768,353, Aug. 23, 1904.

In a paper machine, the web of paper, after passing from the suction rolls on to the long felt, comes in contact with an upper apron travelling in unison with the long felt. The surface of the apron which is in contact with the web of paper is composed of a coarsely woven fabric, such as jute, which, passing through the press-rolls with the paper, imparts to the latter a roughened surface on the side with which it is in contact. The other side of the apron, which is reversible, may be employed when desired for giving a smoother surface.—J. F. B.

Paper; Process of Making — R. S. Case, Unionville, Conn. U.S. Pat. 768,422, Aug. 23, 1904.

A SERIES of disconnected and bevel-edged webs of paper of uniform character are formed upon a single travelling apron by gathering pulp from the vat by a cylinder and forming it into a number of independent webs or plies, which are transferred to the blanket. The same operation is repeated a certain number of times in succession, each fresh ply being couched upon the previous one, and each successive ply being slightly wider than the last. The resulting bevel-edged webs are then pressed and trimmed, colour is applied to the edges if desired, and the whole series is dried simultaneously. (See also U.S. Pat. 759,862; this J., 1904, 677.)—J. F. B.

FRENCH PATENTS.

Cellulose from Green Alfa [Esparto]; Preparation of — P. Bouby and A. Deiss. Fr. Pat. 341,930, Feb. 16, 1904.

THE esparto, in the perfectly fresh green state, is sorted and subjected to a preliminary mechanical breaking treatment; the plant is then treated in open vessels with five times its weight of an alkaline solution, either hot or cold. After sufficient steeping the cellulose is separated, washed, and bleached. The sediment deposited from the used alkaline baths serves for the manufacture of a green-coloured soap.—J. F. B.

Rosin Soap for Sizing Paper and Millboard; Manufacture of — A. Sauvage. Fr. Pat. 341,844, April 6, 1904.

THE soap is prepared at high temperatures by introducing very hot, molten rosin gradually into a boiling solution of the alkali concentrated to its saturation point. Boiling water is added from time to time, to replace that lost by evaporation, and to prevent crystallisation of the alkali.

—J. F. B.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Cerite Earths; Preparation of — in the Pure State by the Aid of their Alkali Double Carbonates. R. J. Meyer. Z. anorg. Chem., 1904, 41, 97—125.

THE following alkali double carbonates were prepared and analysed:—*Potassium Salts:* Potassium lanthanum carbonate, $K_2La_2(CO_3)_4 \cdot 12H_2O$; potassium cerium carbonate, $K_2Ce_2(CO_3)_4 \cdot 12H_2O$; potassium praseodymium carbonate, $K_2Pr_2(CO_3)_4 \cdot 12H_2O$; and potassium neodymium carbonate, $K_2Nd_2(CO_3)_4 \cdot 12H_2O$. *Ammonium Salts:* Ammonium lanthanum carbonate, $(NH_4)_2La_2(CO_3)_4 \cdot 4H_2O$; ammonium cerium carbonate, $(NH_4)_2Ce_2(CO_3)_4 \cdot 6H_2O$; ammonium praseodymium carbonate, $(NH_4)_2Pr_2(CO_3)_4 \cdot 4H_2O$; and ammonium neodymium carbonate, $(NH_4)_2Nd_2(CO_3)_4 \cdot 4H_2O$. *Sodium Salts:* Sodium lanthanum carbonate, $Na_2La_2(CO_3)_4 \cdot 20H_2O$; sodium cerium carbonate, $Na_2Ce_2(CO_3)_4 \cdot 24H_2O$; sodium praseodymium carbonate, $Na_2Pr_2(CO_3)_4 \cdot 22H_2O$; and sodium neodymium carbonate, $Na_2Nd_2(CO_3)_4 \cdot 22H_2O$. The sodium salts were all amorphous unstable compounds, and were possibly contaminated with adherent sodium carbonate. The ammonium and sodium double salts are only very slightly soluble in the corresponding alkali carbonate solutions. The potassium salts, on the other hand, are easily soluble in a concentrated solution of potassium carbonate, but the degrees of solubility of the several salts examined differed considerably one from another. If the concentrated solutions be diluted with water, the potassium double carbonates separate in the following order: lanthanum, praseodymium, cerium, neodymium. A crude lanthanum salt can be almost completely freed from cerium and didymium by three precipitations as potassium double carbonate, whilst at the same time the didymium splits up to a considerable extent into praseodymium and neodymium. Praseodymium oxide contaminated with small quantities of cerium, neodymium and lanthanum can be completely freed from cerium and neodymium by three precipitations as potassium double carbonate. The lanthanum can be almost completely removed by systematic fractional crystallisation of the praseodymium oxalate from nitric acid solution. The praseodymium oxide obtained by ignition of the oxalate invariably has the composition Pr_2O_{11} or $4PrO_3 \cdot Pr_2O_3$; the formula Pr_2O_7 or $2PrO_3 \cdot Pr_2O_3$, accepted by Auer von Welsbach and by Jones, is incorrect.—A. S.

Mercuric Chloride in Corrosive Sublimata Pastilles; Volumetric Determination of — R. Corradi. XXIII., page 913.

Methyl Alcohol; Determination of — in Formaldehyde. H. Bamberger. XXIII., page 914.

Quinine Sulphate; Testing of — B. H. Paul. XXIII., page 914.

Quinine Sulphate; Testing of — D. Howard. XXIII., page 914.

Volatile Oil of Mustard; Determination of — Vuillemin. XXIII., page 914.

ENGLISH PATENTS.

Methyl Groups of Aromatic Hydrocarbons; Oxidation of — J. Y. Johnson, London. From The Radische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, Germany. Eng. Pat. 17,982, Aug. 19, 1903.

THE methyl groups of aromatic hydrocarbons are oxidised in acid solution to aldehyde groups by means of the sul-

phate of manganese dioxide obtained by the action of electrolytic oxygen on a solution of manganous sulphate in sulphuric acid (see Eng. Pat. 17,981 of 1903; this J., 1904, 749). For example, a solution of the sulphate of manganous peroxide obtained from six parts of manganous sulphate is added slowly to five parts of *o*-nitrotoluene at a temperature of 50° to 60° C., with constant stirring; the mixture is heated to 100° or 110° C. until decolorised, and the product distilled with steam, the distillate consisting of *o*-nitrobenzaldehyde and unchanged *o*-nitrotoluene; the solution is oxidised electrolytically and used for a further operation. Toluene is oxidised to benzaldehyde similarly, and also to benzoic acid if sufficient oxidising agent and high enough temperature be employed.—T. F. B.

Roasting Chemicals and the like; Apparatus for — T. P. Thomas, J. L. Richardson, and P. Davies. Eng. Pat. 21,896, Oct. 12, 1903. I., page 894.

Suprarenal Glands; Manufacture of Compounds of the Active Substance of — O. Imray, London. From Farbwerke vorm. Meister, Lucius and Brüning, Hoechst-on-the-Maine, Germany. Eng. Pat. 24,723, Nov. 13, 1903.

ADRENALIN, the active principle of the suprarenal gland, may be dissolved in a solution of boric acid or of one of its derivatives (e.g., phenylboric acid). The resulting solutions are not precipitated by the addition of alkali. The compound of adrenalin and boric acid may be obtained in the dry state by evaporating the solution (preferably *in vacuo*) or by precipitation with absolute alcohol from a concentrated solution.—T. F. B.

Protocatechuic Aldehyde and its Derivatives [Vanillin]; Manufacture of — A. Verley, Paris - Neuilly. Eng. Pat. 25,546, Nov. 23, 1903. Under Internat. Conv., Nov. 27, 1902.

SEE Fr. Pat. 326,775 of 1902; this J., 1903, 819.—T. F. B.

UNITED STATES PATENTS.

Cyclohexanolidene Acetone and Process of Making same. G. Merling, Frankfort, and H. Eichwede, Hoechst-on-the-Maine, Assignors to Farbwerke vorm. Meister, Lucius and Brüning, Hoechst-on-the-Maine, Germany. U.S. Pat. 768,339, Aug. 23, 1904.

SEE Eng. Pat. 3173 of 1903; this J., 1904, 208.—T. F. B.

Pyrazolone Compound [with Butylchloral Hydrate], and Process of Making same. M. Overlach, Greiz, Assignor to Farbwerke vorm. Meister, Lucius and Brüning, Hoechst-on-the-Maine, Germany. U.S. Pat. 768,398, Aug. 23, 1904.

SEE Eng. Pat. 15,782 of 1903; this J., 1904, 679.—T. F. B.

Theophylline; Process of Making — M. C. Massie, Washington, Administrator of F. Ach, Assignor to C. F. Boehringer und Soehne, Mannheim-Waldhof, Germany. U.S. Pat. 768,533, Aug. 23, 1904.

SEE Eng. Pat. 5901 of 1903; this J., 1903, 648.—T. F. B.

Extracting Essence; Apparatus for — E. E. Hand, New York. U.S. Pat. 768,575, Aug. 23, 1904.

THE material to be extracted is placed in a horizontal, perforated, cylindrical cage, mounted on a horizontal shaft projecting from each end, by means of which it is supported in an outer, horizontal, cylindrical vessel or "still." Means are provided for rotating and for withdrawing the inner cage, one end of the still being removable, and the end of the shaft passing through this removable head of the still being connected with the rotating mechanism, which is mounted on a truck running on rails.—W. H. C.

FRENCH PATENTS.

Halohydrins of the Aromatic Series, and Amino Alcohols derived therefrom; Process for Obtaining — Poulenc Frères and E. Fourneau. Fr. Pat. 338,389, June 23, 1903.

EPICHLORHYDRIN reacts with phenyl (or other aromatic derivative of) magnesium halides, forming two classes of

products, *viz.*, substituted chloropropenes, and substituted chloropropanols, which can be separated by fractionation. Using phenyl magnesium bromide, for instance, phenylchloropropene and phenylchloropropanol are produced. On heating the arylchloropropanols with fatty amines, amino-alcohols derived from propane are obtained. Thus, from phenylchloropropanol and dimethylamine, dimethylaminophenylpropanol results. The following compounds are also described:—Phenylpropenol, phenylchlorobutanol, anisylchloropropanol, phenyl- and trimethylaminopropanol. All these compounds have agreeable odours, and are applicable to perfumery.—T. F. B.

Alcohols and their Derivatives; Production of New Compounds, and General Method of Preparing Primary — L. Bouveault and G. Blanc. Fr. Pat. 338,895, June 27, 1903.

See Eng. Pat. 14,758 of 1903; this J., 1904, 798.—T. F. B.

Formic Acid from Formates; Production of Concentrated — M. Hamel. Fr. Pat. 341,764, March 30, 1904.

CONCENTRATED formic acid is obtained by dissolving the formate in some solvent which, on subsequently distilling the solution, will not dilute the formic acid, and then decomposing the formate with concentrated sulphuric acid or an acid sulphate. Suitable solvents are formic or acetic acids, formic acid being preferable. The sodium formate may be dissolved in an equal weight of concentrated formic acid, and sulphuric acid and sodium formate added alternately, until the retort is sufficiently full, when the contents are distilled.—T. F. B.

Formates; Process for Making — R. Koepp and Co. Fr. Pat. 342,168, April 6, 1904.

CARBON monoxide reacts more rapidly on alkali hydroxides in presence of water than in the dry state, and the reaction is also more rapid with rise of temperature, owing to the increasing solubility of carbon monoxide. Sodium formate can be produced by running a solution of sodium hydroxide of 40° B. on to a mass of coke heated to 220° C. in a closed vessel, and blowing heated carbon monoxide through the liquid for three-quarters of an hour. In place of alkali hydroxides, the oxides or carbonates of the alkaline earth metals or alkali carbonates may be employed.—T. F. B.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

ENGLISH PATENTS.

Photographic Emulsions; Sensitising — with the Aid of Dyestuffs. H. E. Newton. London. From Farbenfabr. vorm. F. Bayer and Co., Elberfeld, Germany. Eng. Pat. 23,723, Nov. 2, 1903.

See Fr. Pat. 336,298 of 1903; this J., 1904, 337.—T. F. B.

Furnaces especially adapted for the Separation of Gold and other Precious Metals from the Sweepings of Jewellers' Warehouses, Photographers' Waste, and the like. S. W. Price. Eng. Pat. 19,984, Sept. 16, 1903. X., page 902.

FRENCH PATENT.

Photography of Colours. J. Hero. Fr. Pat. 342,037, April 12, 1904.

PHOTOGRAPHS in natural colours are obtained by the following process:—An ordinary dry plate is immersed for about six minutes in a solution prepared by dissolving 50 grms. of gelatin in a litre of water, and then adding solutions containing alum, 5 grms.; ferrous sulphate, 15 grms.; Judea bitumen, 10 grms.; potassium ferricyanide, 7 grms.; potassium ferrocyanide, 6 grms.; uranium nitrate, 5 grms.; "paraffin," 5 grms.; white gum, 10 grms. The plate is dried, exposed in the usual way, developed by means of diaminophenol, and fixed as usual. A print is made on gelatino-chloride paper in the usual way, and toned and fixed in a bath containing gold chloride, lead acetate, alum, and sodium thiosulphate in stated proportions. The

print is finally immersed for about one minute in a bath similar to that used for preparing the dry plate, with the exception that barium sulphate is used and the gelatin is omitted, the proportions being also slightly modified.

—T. F. B.

XXII.—EXPLOSIVES, MATCHES, Etc.

UNITED STATES PATENT.

Explosive Compound. N. Ceipek, Vienna. U.S. Pat. 768,512, Aug. 23, 1904.

See Fr. Pat. 341,021 of 1904; this J., 1904, 837.—T. F. B.

FRENCH PATENTS.

Explosive Materials and Powders; Method of Manufacture of — A. Mikolajczek. Fr. Pat. 341,911, April 6, 1904.

GLYCEROL dinitrate is prepared by adding nitric acid of sp. gr. 1.5 (33 parts) to glycerin (10 parts) under continuous stirring and cooling. The mixture is allowed to stand for several hours at 10° C., diluted with 10 parts of water, and then neutralised with calcium carbonate. After a further period of standing, the greater part of the glycerol dinitrate rises to the surface, and can be separated, the remainder being extracted from the liquid by means of ether. Glycerol dinitrate is a colourless oil soluble in water and nitroglycerin (glycerol trinitrate), and dissolves and gelatinises collodion cotton, &c. It does not solidify at low temperatures, and its admixture with the trinitrate lowers the freezing point of the latter. The following are mentioned as examples of explosives containing this body:—glycerol dinitrate (61 per cent.), collodion cotton (1.8 per cent.), saltpetre (30 per cent.), and wood meal (7.2 per cent.), and also glycerol dinitrate (45 per cent.), glycerol trinitrate (30 per cent.), chalk (2 per cent.), kieselguhr (23 per cent.).—G. W. McD.

Matches; Method of Manufacture of Phosphorus-free Paste for — J. D. Riedel. Fr. Pat. 342,040, April 9, 1904.

BARIUM-copper poly(di-, tri-, tetra-, penta-)thionate (10 parts) is mixed with sulphur (8 parts). Under the action of pressure or heating a sulpho-polythionate is produced. The paste has the following composition:—Barium-copper sulpho-polythionate (20 per cent.), powdered pumice (27.2 per cent.), potassium chlorate (44.8 per cent.), and gum (8 per cent.).—G. W. McD.

XXIII.—ANALYTICAL CHEMISTRY.

INORGANIC—QUANTITATIVE.

Oxidising Substances; Use of Hydrazine Sulphate in the Determination of — U. Roberto and F. Roncali. L'Ind. Chimica, 1904, 6, 178—179; Chem. Centr., 1904, 2, 616.

SUBSTANCES capable of evolving oxygen react with hydrazine sulphate according to the equation, $H_2SO_4 \cdot N_2H_4 + O_2 = H_2SO_4 + 2H_2O + N_2$. For example, if potassium permanganate be heated gently with hydrazine sulphate, the solution is decolorised and nitrogen is evolved: $4KMnO_4 + 6H_2SO_4 + 5H_2SO_4 \cdot N_2H_4 = 2K_2SO_4 + 4MnSO_4 + 5H_2SO_4 + 16H_2O + 5N_2$. Then, from the volume of nitrogen evolved, the amount of permanganate can be ascertained in a manner similar to that previously described for bleaching powder (this J., 1904, 623). Bichromates, peroxides, chlorates, and other compounds of a similar character can also be determined in this manner.—A. S.

Magnesium; Colorimetric Determination of — O. Schreiner and W. S. Ferris. J. Amer. Chem. Soc., 1904, 26, 961—967.

THE following solutions are required: (1) fifty grms. of ammonium molybdate in 1 litre of water; (2) nitric acid, sp. gr. 1.07; (3) 0.5045 gm. of crystallised sodium phosphate, $Na_2HPO_4 \cdot 12H_2O$, and 100 c.c. of nitric acid of sp. gr.

1.07 in 1 litre; (4) a standard colorimetric solution prepared by diluting 10 c.c. of the sodium phosphate solution (3) to about 80 c.c., then adding 9 c.c. of nitric acid (2) and 8 c.c. of the ammonium molybdate solution (1) and making up to 100 c.c.; (5) phosphate reagent, prepared by dissolving 17.4 grms. of potassium hydrogen phosphate, K_2HPO_4 , and 100 grms. of ammonium chloride in about 900 c.c. of water, adding 50 c.c. of ammonia (sp. gr. 0.9) and diluting to 1 litre. Fifty c.c. of the solution to be examined are evaporated in a basin to dryness after adding one drop of ammonia and two or three drops of saturated ammonium oxalate solution. The residue is treated with 1 c.c. of the phosphate reagent (5), well stirred and allowed to stand two hours, when 5 c.c. of dilute ammonia (1:9) are added, and the precipitate is collected on a filter. The precipitate is washed with the dilute ammonia five times by decantation, and then on the filter until the filtrate measures 50 c.c. The basin is washed once with 5 c.c. of water, which is poured on the filter. 5 c.c. of nitric acid (2) are added to the basin, poured on the filter, after removing the vessel containing the ammoniacal washings and substituting another, and both basin and filter are washed with hot water until about 45 c.c. of filtrate have been obtained. To the cooled liquid 4 c.c. of the ammonium molybdate solution (1) are added, and after 20 minutes, the coloration is compared with that produced by known quantities of the colorimetric phosphate solution (4). 1 c.c. of the latter is equivalent to 0.00001 grm. of phosphoric anhydride or 0.0000342 grm. of magnesium. Any silica present is completely removed during the washing process.—W. P. S.

Lime in Cement; Rapid Method for the Determination of —. B. Enright. J. Amer. Chem. Soc., 1904, 26, 1003—1005.

The powdered cement is agitated with hot dilute hydrochloric acid, a few drops of bromine-water are added, and the solution is boiled, rendered alkaline with ammonia, and filtered. The residue is treated with hydrochloric acid, and the solution diluted. After once more adding ammonia in slight excess, boiling, filtering, and washing, the united filtrates are slightly acidified with hydrochloric acid and boiled. Ammonium oxalate solution and ammonia are added to the boiling solution, the precipitate is washed with hot water, and dissolved in sulphuric acid, and the solution immediately titrated with potassium permanganate solution.—W. P. S.

Gold Determination by means of the Purple of Cassius Test, for Cyanide Works. A. Priester. J. Chem., Met. and Min. Soc. of S. Africa, 1904, 4, 455.

The process is a modification of the one previously described (this J., 1904, 207). Potassium cyanide is added to the cyanide solution to be tested, until the proportion of free cyanide reaches about 1 per cent. 1 grm. of zinc dust is added to each 200 c.c. of the solution, and, after boiling, the solution is filtered, and the zinc dust remaining is dissolved by warming with dilute sulphuric acid. The zinc sulphate solution is passed through the same filter. The residual metals are dissolved in 10 c.c. of dilute *aqua regia*, and the boiling solution is passed repeatedly through the same filter. To the gold solution collected in a test tube, and cooled, a few drops of stannous chloride solution are added, and, if the proportion of gold is small, time is allowed for formation of the coloration.—E. S.

Lead, Iron, Lime, Sulphur, Cadmium, and Copper in Commercial Zinc Ores; Determination of —. W. G. Waring. Eng. and Mining J., 1904, 78, 298—299.

The author from a long practical experience finds the following methods give accurate results with the least expenditure of time:—

Lead.—From 0.5 to 3 grms. of the ore are decomposed with nitric acid, 2 or 3 c.c. of strong sulphuric acid are added, the mixture is evaporated till white fumes appear, cooled, diluted, and then boiled until the soluble sulphates are dissolved. The insoluble residue containing the lead as sulphate is filtered off, washed with water containing 2 or 3 c.c. of sulphuric acid per litre, and digested with 15 or 20 c.c. of a hot solution of ammonium carbonate, the lead carbonate dissolved by means of 5 or 6 c.c. of glacial acetic

acid or 15—20 c.c. of hot 30 per cent. acid, and the solution titrated with standardised potassium ferrocyanide solution, using uranium acetate or nitrate as indicator. The solution must not contain more than 0.2 grm. of lead per 100 c.c. If the amount of lead sulphate separated at first corresponded to only 50 mgrms. or less of lead, more accurate results are obtained by dissolving the lead sulphate by repeated boiling with ammonium acetate solution, washing the residue with 15—25 c.c. of hydrochloric acid of sp. gr. 1.4, heating the solution with a pellet of pure zinc, and weighing the separated lead.

Iron.—For the determination of iron, the ferric hydroxide separated in the ordinary zinc assay is reduced by sulphuric acid and zinc, or by means of stannous chloride, and the solution titrated with permanganate solution.

Lime.—Iron and manganese are separated by precipitation with excess of ammonia in presence of ammonium chloride, and the calcium is precipitated as oxalate. If the ore contain a large proportion of lead, the calcium oxalate should be redissolved and again precipitated.

Sulphur.—0.25 grm. of a blende ore, or a larger amount in the case of an oxidised ore or roasted blende, is ground with 0.5 grm. of dry sodium carbonate, 0.25 grm. of potassium chlorate, and 1.9 grms. of pure manganese dioxide, and the mixture transferred to a platinum or porcelain crucible lined with magnesia. The mixture is covered with a little magnesia, and the crucible is then heated, gently at first, and finally to full redness for 15—20 minutes. After cooling, the contents of the crucible are emptied into water and the sulphur determined as in Keschka's method, except that no addition of bromine is required. For more exact results, the insoluble residue should be dissolved in hydrochloric acid, and any sulphur present determined. A blank test must always be made with the manganese dioxide.

Cadmium and Copper.—The ore is decomposed with hydrochloric acid or *aqua regia*, the excess of acid expelled, the solution diluted and filtered, and sufficient acid added to the filtrate to bring its acidity up to the equivalent of 10 c.c. of hydrochloric acid of sp. gr. 1.10 per 250 c.c. Hydrogen sulphide is then passed through the solution, the precipitated sulphides are treated with dilute sulphuric acid to dissolve the cadmium and zinc, and acid or alkali is added to the solution to make its acidity equivalent to about 6.5 per cent. by weight of sulphuric acid. The solution is then heated to 70° C. and the cadmium precipitated by hydrogen sulphide.

Other Elements.—Gold and silver, antimony, arsenic, selenium, tellurium, thallium, iridium, bismuth, manganese, cobalt, and nickel may also be present in zinc ores. For the determination of gold and silver by the crucible or scorification method, the ore must first be decomposed by hydrochloric acid and the zinc removed by treatment with water. Skinner and Hawley's method (this J., 1902, 1156) has been found to be the best for the determination of arsenic and antimony. Thallium, iridium, tin, and bismuth are precipitated together with silver, cadmium, copper, and part of the antimony, tellurium, &c., by means of aluminium from acid solution, as a preliminary step to the separation of zinc by hydrogen sulphide in the presence of formic acid. In the metallic residue, the elements named are determined by the usual methods.—A. S.

Nitrogen Determinations [Kjeldahl]; Influence of the Alkalinity of Glass on the Accuracy of —. K. Barelt and R. Schönewald. Woch. f. Brau., 1904, 21, 523.

PARALLEL blank distillations made in an apparatus which had been in use for a considerable time, and in a similar but perfectly new apparatus, showed that with the new apparatus the errors due to the glass were considerably greater than with the old one. It is therefore advisable to "age" a new apparatus before use by boiling water in it. (See also this J., 1904, 269.)—J. F. B.

Nitrogen in Water; Method for the Determination of Ammoniacal and Protein —. J. Effront. Monit. Scient., 1904, 18, 669—674.

THE method is based on the reduction of alkali hypochlorite to chloride by ammonia and albuminoid substances. 1 litre

of the water is allowed to stand for two hours with 20 c.c. of $N/1$ sodium carbonate solution and 20 c.c. of a standardised hypochlorite solution (prepared by digesting 50 grms. of bleaching powder with 1 litre of water). Excess of a standard solution of arsenious acid (containing 4.586 grms. of arsenious acid and 15 grms. of sodium carbonate per litre) is then added, and the excess determined by titration with a solution of iodine in potassium iodide, corresponding to the arsenious acid solution. 1 c.c. of this iodine solution corresponds to 0.5 mgrm. of ammonia. Protein nitrogen is determined by evaporating 1 litre of the water with 0.5 to 1 gm. of sodium carbonate to a volume of 150 c.c., diluting to 1 litre, and then treating as in the determination of ammonia, with the exception that the solution must stand for 14 to 16 hours instead of for 2 hours only. 1 c.c. of iodine solution corresponds to 0.215 mgrm. of protein nitrogen. By this method it is stated that 0.5 mgrm. of nitrogen can be determined in 1 litre of water.—T. F. B.

Iron; Colorimetric Determination of Small Amounts of — by Acetylacetone [especially applicable to Water Analysis]. H. B. Pulsifer. J. Amer. Chem. Soc., 1904, 26, 967—978.

The method is based upon the fact that acetylacetone, $\text{CH}_3\text{CO}\cdot\text{CH}_2\cdot\text{CO}\cdot\text{CH}_3$, gives an intense red coloration with ferric salts. For the determination of iron in water, 100 c.c. or more of the latter are evaporated to dryness and all organic matter removed by treating with sulphuric and nitric acids. The residue is warmed with a few drops of dilute sulphuric acid and a drop of hydrochloric acid, filtered, and the filtrate oxidised by a trace of nitric acid. If the amount of iron present be very small, the solution must be evaporated almost to dryness to expel excess of acid. If larger amounts be present the solution may be diluted to 500 c.c. or 1000 c.c. without removing the acid. A definite portion of the solution is then transferred to a Nessler tube, 2 c.c. of a 0.5 per cent. aqueous solution of acetylacetone is added, and the tube filled up to the mark with water. The contents must be well mixed. The coloration produced is compared with that yielded by a known amount of iron. In no case should the colour be matched by pouring out one or other of the solutions until the tints are equal, but a number of standard tubes should be used. The colour is very permanent, and there are practically no substances which interfere with the reaction. The test is more sensitive than the potassium thiocyanate one, the limit being 0.000003 grm. of iron.—W. P. S.

Mercuric Chloride in Corrosive Sublimite Pastilles; Volumetric Determination of —. R. Corradi. Boll. Chim. Farm., 1904, 43, 424—427. Chem. Centr., 1904, 2, 617.

The method is based upon the reaction: $\text{HgCl}_2 + 2\text{KI} = \text{HgI}_2 + 2\text{KCl}$. The mercuric iodide produced dissolves in the excess of potassium iodide, with formation of a double salt, $\text{KI}\cdot\text{HgI}_2$. A 2 per cent. solution of potassium iodide is added, drop by drop, to 10 c.c. of a 1 per cent. solution of mercuric chloride, till the exact amount required to just re-dissolve the precipitate produced is determined. A corresponding determination is then made with, for example, an aqueous solution of five corrosive sublimate pastilles. Sodium chloride, vaseline oil, and colouring matters (Eosine, Erythrosin) are stated to have no influence on the results.—A. S.

ORGANIC—QUALITATIVE.

Turpentines; Technical Analysis of Spirits of —, with a New Method for the Detection of Petroleum Adulterations and Wood Spirits of Turpentine. J. M. McCandless. J. Amer. Chem. Soc., 1904, 26, 981—985.

For the detection of petroleum and wood turpentine in turpentine, determinations of the flashing point and specific gravity were found to be useless, the iodine value also giving no decisive evidence (see this J., 1904, 302) when only small quantities of the adulterants were present. Polymerization with sulphuric acid, followed by steam distillation and a determination of the refractive index of the distillate, however, afforded a reliable means of detecting 5 per cent.

or less of petroleum in turpentine. 100 c.c. of the turpentine were cautiously treated with 50 c.c. of concentrated sulphuric acid, with constant agitation and cooling. After adding 25 c.c. of water, the mixture was steam-distilled until 100 c.c. of distillate, consisting of oil and water, were collected. The oily layer was separated and treated with its own volume of fuming sulphuric acid. The resulting mixture was poured into water, the oil separated and steam-distilled. The distilled oil was again treated with fuming sulphuric acid and re-distilled. The refraction of the oil obtained was then determined at 25° C. by means of a Zeiss butyrorefractometer. In no case with a genuine sample of turpentine or wood turpentine, did the reading fall below 30 (scale degrees), but with adulterated oils, containing even as little as 1 per cent. of petroleum, the reading fell as low as 25, and could be reduced to 22 by further treatment with sulphuric acid. The final volume of the oil obtained roughly represented the quantity of petroleum present. Petroleum having been proved to be absent, the following method was employed for the detection of the wood turpentine:—100 c.c. of the sample are slowly distilled and the refraction of the first 0.5 c.c. of distillate determined. At 25° C., genuine turpentines gave readings from 60 to 63, and wood turpentine from 57 to 59. If no indication of adulteration was detected by this initial reading, the distillation was continued, and the refraction of the 97th and 98th c.c. observed. Genuine turpentine did not give a higher reading than 77, usually much less, whilst with wood turpentine, the reading exceeded 77, and even reached 90. A further distinction was noticed during the distillation. In the case of the genuine turpentines 95 c.c. distilled over below 165° C., but if admixed with any wood turpentine, when 95 per cent. had come over, the temperature would be found to be much higher than 165° C.—W. P. S.

ORGANIC—QUANTITATIVE.

Tannic and Gallic Acids; Determination of —. W. P. Dreaper. Chem. News, 1904, 90, 111—112.

The author considers that until further evidence is brought forward, the use of collin as a precipitant for tannin, as recommended by Parker and Payne (this J., 1904, 648), must be regarded with suspicion. In a test with a solution containing equal parts of tannic and gallic acids, it is stated that about 60 per cent. of the gallic acid was separated with the tannin-collin compound. The author recommends the following modification of his earlier process (this J., 1893, 412), and claims that it enables one to differentiate between tannic and gallic acids, and also between tannin acids soluble and insoluble respectively in ammonium carbonate solution. Three solutions are required: (1) Standard copper sulphate solution of a strength equivalent to 0.05 grm. of copper oxide per c.c.; (2) solution containing 50 grms. of ammonium carbonate and 50 grms. of sodium sulphate per litre; (3) solution containing 20 grms. of lead acetate and 60 c.c. of glacial acetic acid per litre.

Total Tannic and Gallic Acids.—50 c.c. of the tannin solution containing 10—15 grms. of tannin material per litre are heated with excess of calcium carbonate, cooled, and titrated with the copper solution, with ferrocyanide indicator, as previously described (*loc. cit.*). The result, expressed as copper oxide, represents the total tannic and gallic acids, and, from the dyers' point of view, the "mordant value" of the tannin extract.

Tannic Acid Insoluble in Ammonium Carbonate Solution.—50 c.c. of the tannin solution are treated with 25 c.c. of No. 2 solution, and titrated with the copper solution; the reaction proceeds slowly towards the end, and the final colour test with the ferrocyanide, which must be rendered strongly acid with acetic acid, should be made after the lapse of three minutes. The copper tannate produced is free from gallate. In the case of an unknown extract, the precipitate may be filtered off, and weighed at 105° C., and the amount of tannic acid present calculated, the weight of copper oxide being known.

Total Tannic Acid.—50 c.c. of the tannin solution are treated with 10 c.c. of No. 3 solution and some barium sulphate, and the mixture well shaken. The solution is

filtered through a dry paper, lead is precipitated in the filtrate by adding a little anhydrous sodium sulphate, and after five minutes the solution is again filtered through a dry paper. 40 c.c. of the filtrate are heated with calcium carbonate, and titrated with the copper solution. The result obtained gives the amount of gallic acid, and, by difference, that of the total tannic acid.—A. S.

Methyl Alcohol; Determination of — in Formaldehyde. H. Bamberger. *Z. angew. Chem.*, 1904, 17, 1246—1248.

It is alleged that the method of Gnehm and Kaufner (this J., 1904, 626) gives too low results owing to the presence of aldehyde in the distillate (caused by the partial decomposition of the aldehyde and sodium sulphinate condensation product). More accurate results (3—4 per cent. higher) were obtained by "fixing" the aldehyde with sodium bisulphite. 50 c.c. of formaldehyde (about 38 per cent.) are treated with 140 c.c. of a bisulphite solution containing 1 gm.-mol. in 200 c.c. of water, and the liquid then neutralised with caustic soda. The neutrality of the liquid must be tested by transferring a drop on to Brilliant Yellow or phenolphthalein paper. If too much alkali has been taken, dilute sulphuric acid or bisulphite solution is added. The flask is then fitted with a fractionating column containing glass beads and joined to a long condenser and heated in an oil-bath at 135°—145° C. until about 75 c.c. of distillate have been collected. After washing the condenser with water and making up the volume of the distillate to 100 c.c., the sp. gr. at 15° C. is determined to four places of decimals with a Mohr's balance. By this method the amount of aldehyde which gets into the distillate is negligible.

—E. H. T.

Quinine Sulphate; Testing of —. B. H. Paul. *Chem. and Druggist*, 1904, 65, 428—430.

THE solubility of cinchonidine in ether has been variously given as 1 in 76, 1 in 143, and 1 in 188 parts by weight. The author finds that the normal solubility of cinchonidine in ether, determined by extracting the alkaloid with ether from an aqueous solution of one of its salts, after the addition of sufficient ammonia solution, is 0.004 gm. per c.c. Cinchonidine can, however, form supersaturated ethereal solutions, from which, on allowing to stand, the alkaloid gradually deposits in crystals. The solubility is also considerably influenced by the presence of quinine. The author criticises the B.P. ether-test for quinine sulphate, and states that a far greater degree of precision may be secured more conveniently, by proceeding in the following manner:—1 gm. of the quinine sulphate is dissolved in 100 c.c. of boiling distilled water, and the solution, after cooling, is filtered from the crystallised quinine salt. The filtrate is concentrated to 30 c.c., cooled, filtered through a loose plug of cotton-wool, and the volume made up to 30 c.c., if necessary, by washing the separated crystals with a little water. 5 c.c. of the solution are treated with five drops of ammonia solution and shaken with 1 c.c. of ether in a corked tube, and then allowed to stand in a cool place for one hour. If no crystals are formed at the end of this period, the 5 c.c. of solution contain less than 0.004 gm. of cinchonidine. If crystals are formed, different volumes of the solution, less than 5 c.c., are shaken each with 1 c.c. of ether, the operation being repeated until with two portions of the solution differing in volume by 0.5 c.c., after treating with ammonia solution and shaking with 1 c.c. of ether, and then allowing to stand for 12 hours, a slight formation of crystals takes place in one case, but not in the other. The mean volume of the two portions of solution contains 0.004 gm. of cinchonidine or 0.0054 (0.004×1.35) gm. of cinchonidine sulphate.—A. S.

Quinine Sulphate; Testing of —. D. Howard. *Chem. and Druggist*, 1904, 65, 475.

THE varying statements as to the solubility of cinchonidine in ether mentioned by Paul (see preceding abstract) may probably be explained by differences in the purity of the ether used. A small proportion of alcohol greatly increases the solubility of cinchonidine; ether of the B.P. will dissolve nearly twice as much cinchonidine as *ether purificatus*. Paul's modification of the B.P. ether-test is considered to be

in the wrong direction, since the whole of the cinchonidine will not be contained in the mother liquor of a single recrystallisation. If a solution of commercial quinine sulphate be concentrated and allowed to crystallise, then, specially below 50° C., the cinchonidine sulphate persistently crystallises with quinine sulphate in varying proportions far in excess of those which might be deduced from the relative solubilities of the two salts. For ascertaining the purity of quinine sulphate, the author recommends the test now adopted in the Codex Français:—2 grms. of the sample and 20 c.c. of water are maintained at 60° C., with frequent agitation, for half an hour. The mixture is then allowed to cool, and is kept at 15° C. for half an hour, with frequent agitation. 5 c.c. of the solution mixed with 7 c.c. of *liquor ammoniæ* must remain clear.—A. S.

Volatile Oil of Mustard; Determination of —. Vuillemin. *Apoth.-Zeit.*, 19, 607. *Pharm. J.*, 1904, 73, 218.

FIVE grms. of the powdered seeds are treated in a closed flask with 100 c.c. of water at 25°—30° C., and the mixture is maintained at that temperature for one hour, during which period it is frequently shaken. 20 c.c. of alcohol are then added, and half of the liquid is distilled off, and collected in 30 c.c. of ammonia solution and 3—4 c.c. of 10 per cent. silver nitrate solution, the delivery tube of the condenser dipping below the surface of the liquid. The receiver is connected to a second vessel also containing ammoniacal silver solution. After the distillation, the ammoniacal solution is gently warmed, the silver sulphide filtered off, washed with water, alcohol, and ether, dried at 80° C., and weighed. The weight, multiplied by 8.602, gives the percentage of mustard oil in the powder. Seeds of *Brassica nigra* yielded from 0.815 to 1.19 per cent. of volatile oil. The volatile oil in mustard plasters and papers may also be determined in the above manner, but the maceration with water must be prolonged to 90 mins., whilst, to avoid troublesome foaming, it is advisable to add a further 20 c.c. of alcohol during the distillation and to use a larger distillation flask.—A. S.

Tobacco; Analysis of —. R. Kissling. *Chem.-Zeit.*, 1904, 28, 775—776.

Determination of the Moisture.—The stripped tobacco is first dried over sulphuric acid in an exsiccator, and is then ground and sifted. The powder obtained, forms the raw material for the analysis. The moisture is determined by drying to constant weight 2—3 grms. of the powder in the exsiccator at the ordinary temperature. In 20 samples of different tobaccos, the amount of water determined in this manner varied only from 3.25 to 6.37 per cent.

Determinations of Ash and its Alkalinity are carried out with 2—3 grms. of the tobacco powder in the usual way, except that luteol is used as indicator.

Determination of Nicotine.—Ten grms. of the tobacco powder are mixed with 10 grms. of powdered pumice stone and 10 grms. of a solution of caustic soda containing about 50 grms. per litre. The moist mass is extracted with ether in a Soxhlet or other apparatus, the ether is distilled off from the extract, the residue dissolved in water containing some caustic potash, and the solution distilled in a current of steam. Each 100 c.c. of distillate are titrated with sulphuric acid in presence of luteol as indicator; the fifth fraction should be free from nicotine. 1 mol. of sulphuric acid corresponds to 2 mols. of nicotine.

Determination of Resins.—See this J., 1900, 696.

Determination of the Non-Volatile (Citric, Malic, and Oxalic) Acids.—See this J., 1902, 1104.—A. S.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Solubilities; Influences causing Alterations of —. G. Geffcken. *Z. physik. Chem.*, 1904, 49, 257—302.

THE author has studied the effect of the presence of dissolved electrolytes, chiefly acids and bases, upon the solubility of the gases, hydrogen, oxygen, nitrous oxide, and carbon dioxide, in water at 25° C. and at 15° C. In all the cases examined, the relative depression of the solubility was greater at the lower temperature than at the higher. The

degree of relative depression of solubility depends very much upon the nature of the gas, although the order is almost the same for all gases; the alterations are especially different in the case of the otherwise very similar gases, carbon dioxide and nitrous oxide. The alteration of the solubility due to the electrolytes is probably connected with the alteration of the internal pressure caused by their solution in water. In other experiments, on the influence of the presence of dissolved electrolytes upon the solubility of other electrolytes, the observed divergences from the law of mass-action are probably attributable to the same causes. Colloids in solution have practically no influence on the solvent capacity of water; a notable exception to this rule was found in the case of the solubility of carbon dioxide in a ferric hydroxide "sol," which absorbed about 12 per cent. more of this gas than pure water—a result due probably to the acid and basic nature of the two bodies. Nitrous oxide in aqueous solution was found to be practically indifferent; it cannot therefore be regarded as behaving as the anhydride of hyponitrous acid.—J. F. B.

Ammonia; Decomposition of — by Heat. E. P. Per-
man and G. A. S. Atkinson. *Proc. Roy. Soc.*, 1904, **74**,
110–117.

THE authors examined the rate of decomposition of ammonia by heating in a vessel of porcelain at temperatures between 677° and 1111° C. The results are given in two tables and two curve-diagrams. The rate of decomposition was found to be much influenced by the state of the porcelain globe; it invariably increased after the globe had been used once or twice, owing probably to the action of ammonia or hydrogen upon the porcelain. The results show that the reaction is essentially monomolecular, proceeding according to the equation $\text{NH}_3 = \text{N} + 3\text{H}$. The rate of decomposition is much quickened by the presence of traces of some of the metals, e.g., mercury, iron, platinum. No confirmation of Ostwald's view that the decomposition of ammonia by heat is a reversible reaction, equilibrium being established when 98 per cent. of the ammonia is decomposed, was afforded by the authors' results.—A. S.

Potassium Ferrocyanide; A Reaction of —. A. Gutbier.
Z. anorg. Chem., 1904, **41**, 61–62.

A SOLUTION of potassium ferrocyanide, when warmed with a freshly prepared solution of phenylhydrazine hydrochloride, acquired a brownish-red colour, changing to bright red and then to deep red, and finally became suddenly colourless, with separation of a yellowish-green precipitate and with vigorous evolution of hydrocyanic acid and nitrogen. The mixture was now distilled with steam; a dark-coloured oil, insoluble in caustic soda solution, distilled over, whilst a greenish-blue residue was left, below a layer of a violet-coloured liquid. The volatile oil, after purification, solidified, when cooled by a freezing mixture, to a bright red mass, from which, on an earthenware plate, a yellow oil ran off, whilst a bright red mass, melting at about 45° C., remained behind. The yellow oil, when treated with strong sulphuric acid, was coloured first green and then brown, with separation of a solid, apparently crystalline mass.—A. S.

Trade Report.

I.—GENERAL.

MEXICO; CHEMICAL INDUSTRY AND TRADE OF —.
Foreign Office Annual Series, No. 3262.

The following table shows the quantity and value of certain Mexican exports during the last three years. The world's production of silver in 1903 was, approximately, 165,800,000 troy oz. Of this Mexico, which now holds for the first time the leading position, mining more than the United States, produced 60,000,000 oz. as compared with 58,000,000 oz. in 1902. In 1881 Mexico produced

but 23,000,000 oz.; in 1891, 33,000,000 oz.; and in 1901, 57,500,000 oz.

	1900-01.		1901-02.		1902-03.	
	Quan- tity.	Value.	Quan- tity.	Value.	Quan- tity.	Value.
	Tons.	£	Tons.	£	Tons.	£
Gold.....	..	1,800,000	..	1,900,000	..	2,900,000
Silver.....	..	7,000,000	..	5,500,000	..	6,800,000
Copper.....	33,000	800,000	61,000	1,500,000	62,000	1,600,000
Lead.....	85,000	450,000	98,000	539,000	99,000	550,000
Chile.....	1,100	83,395	1,750	99,000	1,832	119,700
Dyewoods...	41,500	130,218	36,600	107,397	31,805	80,334
Rubber.....	189	37,000	180	32,600	142	23,000
Vanilla.....	..	..	22	44,567	57	98,334

The average annual export of Mexican silver dollars is 15,000,000. 10 per cent. are melted down, and the balance reaches India, the Straits Settlements, China and the Philippines, where it circulates as currency. Those which reach India are also ultimately melted.

The imports of certain goods into Mexico from the United Kingdom were as follows:—

	1900-01.		1901-02.		1902-03.	
	Quan- tity.	Value.	Quan- tity.	Value.	Quan- tity.	Value.
	Tons.	£	Tons.	£	Tons.	£
Cement.....	12,224	17,841	5,597	8,568	3,848	6,501
Chemicals:						
Alkali.....	5,790	51,442	5,714	51,916	5,821	52,341
Copper sulphate ...	80	1,952	171	3,677	220	3,917
Other kinds.....	..	37,358	..	25,543	..	23,808
Earthen- and china- ware.....	..	8,821	..	10,983	..	21,513
Linseed oil.....	94	3,005	91	3,093	122	4,141
Painters' colours and materials.....	..	7,683	..	7,354	..	9,013
Perfumery.....	..	325	..	1,516	..	1,242
	Proof galls.		Proof galls.		Proof galls.	
Spirits.....	11,111	5,128	9,227	4,334	16,127	7,502
Wax, paraffin.....	..	..	36	878	329	7,910

There are over 1,200 sugar mills in Mexico, of which 300 may be considered as important producers, and cane growing and sugar refining are becoming of considerable consequence. The mills, equipped with British or American machinery, are general, and the number is increasing.

The sugar exported, about 20,000 tons annually, now goes almost entirely to the United Kingdom, and the reduction of the duty on imported sugar, which came into effect on May 1, 1904, aims solely at securing for Mexican exported sugar the privileges of the Brussels Convention. Common and refined sugar of all kinds, including the so-called sugar-candy, formerly paid per gross kilo. 15 c. Mexican currency, while the new rate is 2 dols. 50 c. per 100 kilos. gross. Molasses from sugar cane or fucula, as well as preparations for colouring wines, liquors, &c., and for grading up sugar, have hitherto paid duty per gross kilo. 5 c., while the new rate is 2 dols. 25 c. per 100 kilos. gross. The total product of molasses in 1903 was 77,000 tons. The total produce of sugar during the last few years was, during 1900, 78,000 tons; 1901, 95,000 tons; 1902, 103,000 tons; 1903, 112,000 tons; and the 1904 crop is estimated at 126,000 tons.

III.—TAR PRODUCTS, PETROLEUM, Etc.

PETROLEUM; BOUNTIES ON CRUDE —.

Bd. of Trade J., Sept. 8, 1904.

A supplement to the *Canada Gazette* contains the text of an Act, assented to on the 10th August, to provide for the payment of bounties on crude petroleum produced from Canadian wells. The Act is to take effect as from the 8th June 1904.

By this Act the Governor in Council may authorise the payment, out of the Consolidated Revenue Fund, of a bounty of one and one-half cent per imperial gallon on all crude petroleum produced from wells in Canada on and after the 8th June 1904, the said bounty to be paid to the producer of the petroleum.

The Governor in Council may further authorise the payment, out of the Consolidated Revenue Fund, of a bounty of one and one-half cent per imperial gallon on all crude petroleum produced from wells in Canada and held in storage tanks or other storage receptacles on the 8th June 1904, the said bounty to be paid to the actual owner of the petroleum on that day.

ASPHALT PRODUCTION IN THE UNITED STATES.

Eng. and Mining J., Aug. 25, 1904.

The Geological Survey gives the production of asphalt and bituminous rock in the United States in 1903 as follows, in short tons:—

Bituminous sandstone	39,033
Bituminous limestone.....	2,320
Mastic	961
Refined asphalt and gilsonite.....	12,896
Liquid asphalt, or maltha	58
Asphalt from petroleum	41,549
Total	99,917

The largest increase shown last year was in manufactured asphalt—that is, the asphaltic material produced by the distillation of petroleum. Exports of asphalt from the United States in 1903 were valued at 104,586 dols.; imports were 181,579 long tons, of which about two-thirds came from the island of Trinidad. Considerable quantities were also imported from Cuba, Venezuela, and Italy, while some small lots came from Turkey, France, Mexico, and Colombia.

VII.—ACIDS, ALKALIS, Etc.

PHOSPHATE ROCK OUTPUT IN THE UNITED STATES.

Eng. and Mining J., Sept. 1, 1904.

1,581,576 long tons of phosphate rock were mined in the United States in 1903. Of this quantity Florida contributed 860,286 tons; South Carolina, 258,540 tons; Tennessee, 460,530 tons; Arkansas, 2125 tons; and North Carolina, 45 tons. Florida showed a decrease in hard rock phosphates, but a large increase in pebble. The greatest gain last year was in the Tennessee district.

LITHIUM MINERALS IN THE UNITED STATES IN 1903.

Eng. and Mining J., Sept. 1, 1904.

The output of lithium minerals in the United States in 1903 amounted to 1155 short tons, valued at 23,425 dols., as compared with 1245 short tons, valued at 25,750 dols. in 1902. The production includes lepidolite, spodumene and amblygonite, and was obtained entirely from the deposits at Pala, California, and in the Black Hills, South Dakota.

FLUORSPAR OUTPUT OF THE UNITED STATES.

Eng. and Mining J., Sept. 1, 1904.

The output of fluorspar in 1903 amounted to 42,523 short tons, valued at 213,617 dols., against 48,018 short tons, valued at 271,832 dols., in the previous year. The falling off, as shown by these figures, was due partly to the depression in the iron and steel industries, and partly to the fact that considerable stocks of fluorspar were left over from the previous year. Kentucky was the largest producer, followed by Illinois, Tennessee, and Arizona.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

MONAZITE PRODUCTION OF UNITED STATES.

Eng. and Mining J., Aug. 25, 1904.

The Geological Survey reports that the total production of monazite in the United States in 1903 was 862,000 lb.,

an increase of 60,000 lb. over the preceding year. All of last year's output came from placer workings in North and South Carolina.

ASBESTOS PRODUCTION.

Eng. and Mining J., Sept. 1, 1904.

The production of asbestos in the United States in 1903 was only 874 short tons, which compares with 1005 short tons in 1902. Most of the asbestos reported in 1903 came from Sall mountain in Georgia, but small quantities were mined at Dalton, Mass., and near New Hartford, Conn. Some deposits near Lowell, Vermont, are being explored.

TALC AND SOAPSTONE.

Eng. and Mining J., Aug. 25, 1904.

The production of talc and soapstone of all varieties in the United States last year was 58,901 short tons. This is a decrease of 39,053 tons from the preceding year. The falling off was chiefly due to the reduction in the quantity of fibrous talc in New York. The demand for this mineral decreased, owing to a diminution in a production of paper in which talc is used. In other States there was little change.

X.—METALLURGY.

TASMANIA; MINERAL PRODUCTION OF —.

Bd. of Trade J., Sept. 8, 1904.

The following table, showing the quantity and value of the minerals produced in, and exported from, Tasmania during the year 1903, has been compiled from the quarterly statements issued by the Government geologist:—

	Twelve months ended 31st Dec. 1903.		Three months ended 31st March 1904.	
	Quantity.	Value.	Quantity.	Value.
	Oz.	£	Oz.	£
Gold, won	89,887	254,403	14,235	
Gold quartz and pyrites	410	11,304	41	
Silver ore	16,013	107,282	4,008	
Silver-lead bullion.	7,020	235,776	1,094	
Copper, blister	5,812	383,187	1,705	
" ore.....	13	77	27	
" matte.....	3,737	83,624		341,292
Tin ore.....	305	10,822	49	
" metallic.....	2,376	300,098	550	
Zinc ore.....	1,357	4,247		
Iron ore.....	5,323	4,646	3,430	
Other ores.....	373	4,871		
Coal.....	49,069	42,447	11,873	
	Raised			

CANADA; PIG IRON PRODUCTION OF —.

Eng. and Mining J., Sept. 1, 1904.

The American Iron and Steel Association has received, direct from the manufacturers, the statistics of the production of pig iron in Canada in the first six months of 1904. The figures show a decrease as compared with either of the two halves of 1903, as will be seen by the following table, which gives the production by fuels, in gross tons, in half-yearly periods:—

	1903.		1904.
	First Half.	Second Half.	First Half.
Coke.....	123,500	124,405	111,840
Charcoal.....	9,430	8,083	8,803
Totals	132,930	132,488	120,643

Of the total production in the first half of 1904, 35,291 tons were basic pig iron, against 69,325 tons in the first

half of 1903 and 57,567 tons in the second half of that year. A small quantity of Bessemer pig iron was produced in the second half of 1903, but none was made in the first half of 1903 or in the first half of 1904. The unsold pig iron held by Canadian manufacturers on June 30, 1904—none of which was intended for their own consumption—amounted to 36,868 gross tons, as compared with 19,168 tons on December 31, 1903, and 13,585 tons on June 30, 1903. Of the unsold stocks on June 30, 1904, a little less than 4,000 tons were made with charcoal, the remainder being coke iron. On June 30, 1904, Canada had 15 completed blast furnaces, of which six were in blast and nine were idle. Of this total, 11 were equipped to use coke and four to use charcoal. In addition, one coke furnace was being built on June 30, 1904, and one coke and one charcoal furnace were partly erected, but work was suspended. During the first half of 1904, the total number of furnaces in Canada actually in blast for the whole or a part of the period was 10, of which seven used coke and three used charcoal. The number of furnaces idle during the whole period was five, of which four used coke when last in blast, and one used charcoal.

TIN EXPORTS OF THE FEDERATED MALAY STATES.

Bd. of Trade J., Sept. 1, 1904.

The following statement, showing the weight of tin and tin ore (tin exported in the form of ore being taken at 68 per cent. of the gross weight of the ore) exported from the Federated Malay States during the first six months of 1904, with corresponding figures for the corresponding period of the previous year, is taken from the *Selangor Government Gazette* of 22nd July:—

	First Half of 1903.		
	Tin.	Tin exported in the Form of Ore.	Total.
	Piculs.	Piculs.	Piculs.
Perak	80,068'25	123,232'54	203,300'79
Selangor	60,576'00	75,279'28	135,855'28
Negri Sembilan	18,581'26	20,246'91	38,828'17
Pahang	3,108'15	8,723'46	11,831'61
Totals	162,320'66	227,531'17	389,851'83

	First Half of 1904.		
	Tin.	Tin exported in the Form of Ore.	Total.
	Piculs.	Piculs.	Piculs.
Perak	72,182'53	126,718'24	208,900'77
Selangor	57,467'22	82,706'59	140,173'81
Negri Sembilan	22,474'07	16,014'88	38,488'95
Pahang	2,556'12	8,358'78	10,914'90
Totals	154,679'90	233,798'59	388,478'49

NOTE.—Picul = 133½ lb.

ZINC INDUSTRY IN POLAND.

Eng. and Mining J., Aug. 25, 1904.

In 1903 there were in operation three mines in the Olkusz district, in Poland, of which the Joseph and Ulysses mines are owned by the Crown and are leased to the Franco-Russian Company, and the Boleslaw mine is owned by the Sosnowice Company, by which it is operated. Work was carried on through 47 shafts and adits, the number of employees being 1108, of whom 614 were engaged underground. The production of the mines was 4,570,000 poods of calamine and 43,317 poods of lead ore. Each of the three mines has dressing works.

The ores are smelted at the Pauline works of the Sosnowice Company and the Konstantin and Bendin works, owned by the Crown and leased to the Franco-Russian Company. All of these works are situated in the vicinity

of Bendin. They had in operation in 1903 an average of 47 gas-fired furnaces, with about 1818 muffles, and produced 604,034 poods of spelter, of which 248,747 came from the Pauline works, 150,747 from the Konstantin, and 204,538 from the Bendin. In addition to the spelter production, there were produced 31,037 poods of zinc dust. Of the spelter production, 36·26 per cent. was rolled into sheets at the works where smelted.

U.S. IRON ORE PRODUCTION IN 1903.

Bd. of Trade J., Sept. 1, 1904.

An advance abstract of the annual report of the United States Geological Survey upon the production of iron ore in 1903, states that in the year ending December 31st, 1903, the quantity of iron ore produced in the United States was 35,019,308 long tons. This is a decrease of 534,827 tons, or about 1½ per cent., from the maximum of 35,554,135 tons in 1902; but the quantity mined in 1903 is the second largest recorded.

The production of iron ore in the United States during each of the last three years was as follows:—1901, 28,887,479 tons; 1902, 34,554,135 tons; 1903, 35,019,308 tons.

In 1903 the quantity of red hematite mined in the United States was 30,328,634 tons, or 86·6 per cent. of the total for the country, a decrease of 203,495 tons, or about 1 per cent., from the 1902 production of 30,532,149 tons.

The total quantity of brown hematite mined decreased in 1903 to 3,080,399 tons, a loss of 225,085 tons, or 7 per cent.

The production of magnetite in 1903 was 1,575,422 tons, a decline of 113,438 tons, or 7 per cent., from the 1902 total of 1,688,860 tons.

The carbonate ores, the least important class, show an increase, the 1903 total of 34,833 tons being 7,191 tons, or 26 per cent., more than the quantity mined in 1902, 27,642 tons.

The output of concentrated ore in 1903 was 259,469 tons, most of which was magnetically separated, the remainder having been passed through jigs.

In 1903 there were also produced 73,264 tons of zinc residuum for use in the production of spiegeleisen and ferromanganese.

ZIRCON IN THE UNITED STATES.

Eng. and Mining J., Aug. 25, 1904.

3000 lb. of zircon were produced and sold in the United States last year. The mineral is used for the same purposes as monazite. The production all came from two mines at Zirconia, in Henderson county, North Carolina. The zircon occurs in a pegmatite dike, which is about 100 ft. wide and can be traced for nearly 14 miles. This is worked at two places: the Freeman mine, near the southwest end, and the Jones mine, near the north-east end of this dike. Owing to the slight demand there is no systematic working, but the crystals are washed out of the soil largely by women and children.

SWEDEN; MINING INDUSTRY OF —.

Bd. of Trade J., Sept. 1, 1904.

The quantity and value of the minerals extracted during the past year were as follows, corresponding figures for the preceding year being added for comparison:—

	Quantity.		Value.	
	1902.	1903.	1902.	1903.
	Met. Tons.	Met. Tons.	Kr.	Kr.
Iron ore	2,806,610	3,677,841	14,368,506	16,624,311
Silver and lead ore ..	9,378	9,792	183,688	101,005
Copper ore	30,095	36,637	320,841	331,725
Zinc ore	48,783	62,027	1,712,869	2,283,681
Manganese ore	2,850	2,244	51,339	36,550
Iron pyrites .....	..	7,793	..	46,000

The chief iron products show the following results for 1903:—

	Quantity.	Value.
	Metric Tons.	Kr.
Castings	506,825	31,084,488
Unwelded blooms	192,342	20,748,316
Bessemer metal	84,225	8,012,100
"Martin" metal	232,878	24,896,288
Crucible ingot metal	1,105	854,875
Iron and steel bars	178,534	25,879,451
Iron and steel bands and rods	74,823	11,386,234
Wire rods	31,805	4,652,126
Steel tubes (unfinished)	24,930	4,542,581
Strong sheet iron	19,027	2,157,407

NOTE.—Krona = 1s. 1½d., or 18 to the £l.

The output of coal in 1903 was 320,390 metric tons, as against 304,733 metric tons in the preceding year. The refractory clay deposits, which are worked in connection with the extraction of coal, produced in 1903, 172,718 metric tons of clay, or 11,406 metric tons more than in 1902.

SPAIN; MINERAL EXPORTS OF —.

Eng. and Mining J., Sept. 1, 1904.

Exports of mineral for the half year ended June 30 are reported by the *Revista Minera*, as follows, in metric tons:—

	1903.	1904.
Iron ore	3,933,909	3,642,594
Copper ore	542,713	538,794
Zinc ore	68,349	66,541
Lead ore	1,451	2,897
Pyrites	292,688	258,518
Salt	177,871	203,781

Exports of metals for the six months were 18,843 tons of pig iron, against 20,745 tons in 1903; 14,534 tons of copper, against 14,994 tons; 936 tons of spelter, against 1,038 tons; 87,943 tons of lead, against 76,935 tons last year.

XI.—ELECTRO-CHEMISTRY, Etc.

COPPER CONDUCTORS; BRITISH STANDARDS FOR —.

Interim Report by the Engineering Standards Committee, August 1904.

The report, by the Sub-Committee on Cables of the Engineering Standards Committee, commences by defining the standards for copper conductors finally adopted, as follows:—

- (1) A wire 1 metre long, weighing 1 grm., and having a resistance of 0.1539 standard ohm at 60° F., to be taken as the Engineering Standards Committee (E.S.C.) standard for hard-drawn, high conductivity commercial copper.
- (2) Hard-drawn copper to be defined as that which will not elongate more than 1 per cent. without fracture.
- (3) A wire, 1 metre long, weighing 1 grm., and having a resistance of 0.1508 standard ohm at 60° F., to be taken as the E.S.C. standard for annealed, high conductivity commercial copper.
- (4) Copper to be taken as weighing 555 lb. per cb. ft. (8.89 grms. per c.c.) at 60° F., which gives a specific gravity of 8.90.
- (5) The average temperature coefficient of 0.00238 per 1° F. (0.00438 per 1° C.) to be adopted for commercial purposes.
- (6) Two per cent. variation from the adopted standard of resistance to be allowed in all conductors.
- (7) Two per cent. variation from the adopted standard of weight to be allowed in all conductors.
- (8) An allowance of 1 per cent. increased resistance, as calculated from the diameter, to be allowed on all tinned copper conductors between diameters 0.104 and 0.023 (Nos. 12 and 28 S.W.G.) inclusive.

(9) For the purpose of calculation of tables, a lay, involving an increase of 2 per cent. in each wire, except the centre wire, for the total length of the cable, to be taken as the standard.

(10) The legal standard of wire gauge, as fixed by Order in Council dated Aug. 23, 1883, to be adopted as the standard for all wires.

The remainder of the report is occupied by tables giving British standard sizes of stranded conductors for electric supply; British standard radial thicknesses for jute or paper dielectric, lead and armour, for underground cables, for working pressures up to 11,000 volts; and British standard radial thicknesses for rubber dielectric, for lead sheathing and armouring.—T. F. B.

XII.—FATTY OILS, FATS, Etc.

ILANG-ILANG OIL IN THE PHILIPPINES.

Bd. of Trade J., Sept. 8, 1904.

The *Monthly Summary* of commerce of the Philippine Islands contains a review of the trade of those islands during the year 1903, from which the following extract is taken:—

"Among the products of economic value in the Philippines, ilang-ilang oil as an export amounted to 123,182 dols., or about 50 per cent. increase over the trade in 1902, the shipments to France advancing in about the same proportion. Some consider the oil as equal in perfume to attar of roses, and by the greater yield of essence furnishing a less expensive base, it becomes a strong competitor of the latter, the perfumers of the United States (to whom exporting houses in Manila shipped nearly 10,000 dols. worth last year) making it the base of some of their most expensive extracts. The ilang-ilang tree grows best in the Philippines, and it takes about 75 lb. of the flowers, worth from 8 to 15 cents gold per lb., to yield 1 lb. of oil. The cost of manufacture is about 4 dols., and it sells readily for from 40 to 55 dols. in open market, with the supply unequal to the demand."

XVII.—BREWING, WINES, SPIRITS, Etc.

SPIRIT FOR TECHNICAL PURPOSES; USE OF — IN FRANCE DURING 1903.

Z. Spiritusind., 1904, 27, 359.

The following statistics show the use of spirits for domestic and manufacturing purposes in France during 1903:—Total consumption, 374,558 hectols. (1902, 326,660), divided as follows:—For heating and lighting, i.e., denatured in the ordinary way, 262,036 (1902, 227,253); for lacquer, varnish, and polish, 14,447 (1902, 14,188); for dyeing, 533 (1902, 41); for collodion, celluloid, &c., 4595 (1902, 3963); for drugs, 844 (1902, 742); for chemical and pharmaceutical products, 27,027 (1902, 6071); for ether and explosives, 63,879 (1902, 69,996); and for scientific purposes, 519 (1902, 406).

The apparent decrease under the heading of "ether and explosives" is partly accounted for by the inclusion of certain articles under the heading of "chemical and pharmaceutical products."—J. F. B.

XXII.—EXPLOSIVES, MATCHES, Etc.

EXPLOSIVES CONTAINING NITROGLYCERIN.

Bd. of Trade J., Sept. 8, 1904.

The following notice has been issued to mine-owners in the United Kingdom with a view to the prevention of accidents occurring in metalliferous mines from the use of explosives containing nitroglycerin:—

"All cartridges made of dynamite, gelignite, blasting gelatin, and other explosives containing nitroglycerin, must always be thawed (in a properly-designed warming-pan) before use during the months of December, January, February and March, and also at any other times if the cartridges are not in a soft or pasty condition."

Patent List.

N.B.—In these lists, [A.] means "Application for Patent," and [C.S.] "Complete Specification Accepted."

Where a Complete Specification accompanies an Application, an asterisk is affixed. The dates given are (i) in the case of Applications for Patents, the dates of application, and (ii) in the case of Complete Specifications Accepted, those of the Official Journals in which acceptances of the Complete Specifications are advertised.

Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, AND MACHINERY.

- [A.] 18,922. Komata Beefs Gold Mining Co., Ltd. (Brown). Apparatus for mixing or circulating materials in a liquid or semi-liquid state. Sept. 1.
- " 18,978. Huillard. Drying apparatus. Sept. 2.
- " 19,001. Thompson (L'Hospied). *See under II.*
- " 19,002. Rusdell. Fluid heating and cooling apparatus. Sept. 3.
- " 19,174. Hargreaves. Evaporation of solutions, condensation of vapour, and the manufacture of salt. Sept. 6.
- " 19,186. Suzuki. Vacuum evaporating apparatus. Sept. 6.
- " 19,346. Hargreaves. Mixing and agitating solutions, and precipitating and crystallising. Sept. 8.
- " 19,416. Alberger. Condenser system.* Sept. 8.
- " 19,442. Hargreaves. Evaporating solutions and obtaining salts. Sept. 9.
- " 19,497. Turnbull. *See under X.*
- " 19,696. Wurmb and Baumann. Thermometers.* Sept. 13.
- " 20,031. Gaskell and Day. Drying apparatus for distillery refuse and other liquids. Sept. 17.
- [C.S.] 20,775 (1903). Pochin and Pochin. Breaking, crushing, and grinding machinery. Sept. 7.
- " 20,932 (1903). Rakowski. Grinding mills for gradual and variable pulverisation. Sept. 7.
- " 21,765 (1903). Jouve. Manufacture of distilling, evaporating, or like apparatus. Sept. 14.
- " 28,572 (1903). Lake (Trump). Process of evaporating liquors. Sept. 14.
- " 28,593 (1903). Lake (Trump). Vacuum pans. Sept. 14.
- " 6786 (1904). McAulay. Heating furnaces. Sept. 14.
- " 10,157 (1904). Forbes. Distilling and condensing apparatus. Sept. 7.

II.—FUEL, GAS, AND LIGHT.

- [A.] 18,721. Tucker and Grundell. Fuel oil burning system. [U.S. Appl., Sept. 19, 1903.]* Aug. 30.
- " 18,858. Grayson. Manufacture of artificial fuel. Sept. 1.
- " 18,975. Roberts and Anstey. Apparatus for the manufacture of generator gas. Sept. 2.
- " 19,001. Thompson (L'Hospied). Gas furnaces. Sept. 3.
- " 19,087. Ibbotson. Ascension pipes of gas producers. Sept. 3.
- " 19,046. The Chalk Power Gas Syndicate, Ltd., and Pearson. Process for the continuous and concurrent production of fuel gas and lime. Sept. 3.
- " 19,183. Brotherhood. Producer gas manufacturing apparatus. Sept. 6.
- " 19,222. Johnston. Apparatus used in the manufacture of coal-gas. Sept. 6.
- " 19,276. Breckon. Method of producing superior coke in connection with gas works and the like. Sept. 7.

- [A.] 19,307. Gibbons and Masters. Manufacture of gas. Sept. 7.
- " 19,318. Hepburn. Coking. Sept. 7.
- " 19,319. Hepburn. Coke ovens. Sept. 7.
- " 19,568. Tompkins. Production of acetylene derivatives. Sept. 10.
- " 19,744. Blackmore. Process for making hydrogen carbide, and separating sulphur from sulphohydrocarbons or sulphurous petroleum.* Sept. 13.
- " 19,774. Wilson. Manufacture of coal-gas. Sept. 14.
- " 19,827. Cerasoli. Gas producers. Sept. 14.
- " 19,842. Crossley and Rigby. Methods of obtaining power from fuel gases, oils, and other similar combustibles. Sept. 15.
- " 20,075. Cottançin. Method of artificial carbonisation. Sept. 17.
- [C.S.] 19,220 (1903). Wesselsky. Apparatus for generating water- or like gas from small and dust coal. Sept. 14.
- " 20,556 (1903). Lake (Ges. f. Flüssige Gase R. Pictet and Co.). Method of increasing the intensity of incandescent gas light. Sept. 14.
- " 21,724 (1903). Bruce. Gasogenes and the like. Sept. 14.
- " 24,068 (1903). Giellis. Gas retorts. Sept. 21.
- " 24,326 (1903). Hanmer. Treating peat or turf to obtain valuable products therefrom. Sept. 14.
- " 24,670 (1903). Allison. Manufacture of coke. Sept. 21.
- " 27,823 (1903). Wilson. Gas producers. Sept. 14.
- " 2696 (1904). Thompson (Rush). Apparatus for utilising liquid hydrocarbons as fuel. Sept. 14.
- " 5911 (1904). Loomis and Pettibone. Manufacturing and mixing gases. Sept. 7.
- " 14,445 (1904). Boul (Lomax). Method of purifying illuminating gas. Sept. 21.
- " 15,048 (1904). Lake (Bucknam). Gas burners. Sept. 7.
- " 15,706 (1904). Thompson (Verein. Maschinenfabr. Augsburg u. Maschinenbauges. Nürnberg, A.-G.). *See under XXIII.*
- " 16,288 (1904). Act.-Ges. f. Sella-Beleuchtung. Apparatus for the production of mixtures of gas and air. Sept. 14.
- " 16,763 (1904). Boutillier. Apparatus for producing poor gas free from tarry matters. Sept. 14.
- " 17,580 (1904). Patterson. Method of treating coal for coking purposes. Sept. 21.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM, AND MINERAL WAXES.

- [A.] 19,695. Martin and Wynne. Process for purifying petroleum oils and rendering them non-explosive. Sept. 13.
- " 19,744. Blackmore. *See under II.*
- [C.S.] 12,696 (1903). Oppenheimer and Kent. Process for treating tar for the elimination of water and recovery of volatile products therefrom. Sept. 14.

IV.—COLOURING MATTERS AND DYE STUFFS.

- [A.] 18,985. Johnson (Kalle and Co.). Manufacture of mono-azo dyes. Sept. 2.
- " 19,165. Johnson (Badische Anilin und Soda Fabrik). Manufacture of azo colouring matters and of intermediate products relating thereto. Sept. 5.
- " 19,474. Imray (Basle Chemical Works). Manufacture of indoxyl, its homologues or their derivatives. Sept. 9.
- " 19,660. Johnson (Kalle and Co.). Manufacture of new mono-azo dyes. Sept. 12.

- [C.S.] 19,973 (1903). Johnson (Kalle and Co.). Manufacture of colouring matters containing sulphur. Sept. 14.
- " 23,392 (1903). Imray (Meister, Lucius und Brüning). Manufacture of dyestuffs derived from anthracene. Sept. 7.
- " 25,144 (1903). Newton (Bayer and Co.). See under XXI.
- " 25,464 (1903). Johnson (Badische Anilin und Soda Fabrik). Manufacture of acid nitriles. Sept. 14.
- " 26,132 (1903). Newton (Bayer and Co.). Manufacture of new azo dyestuffs. Sept. 14.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

- [A.] 18,720. Wilhelm. Method of cleaning oil waste, &c. Aug. 30.
- " 18,797. Nicholson and Shepherd. Compound batching oil for dressing jute, wool, and like fibrous material. Aug. 31.
- " 19,324. Harris. Treatment of reed grass, wood fibre, and the like. Sept. 7.
- " 19,382. Leachman. Method of finishing and dressing yarns and threads. Sept. 8.
- " 19,385. Bower. Manufacture of substitutes for lithographic stones. Sept. 8.
- " 20,040. Wilkinson. Means or apparatus for gas-sing or cleansing silk and other fibres. Sept. 17.
- [C.S.] 18,897 (1903). Morton. Manufacture of figured fabrics. Sept. 7.
- " 21,667 (1903). Bergmann. Process for the removal of fat extracting solvents from materials. Sept. 21.
- " 21,949 (1903). Gebauer. Apparatus for use in subjecting fabrics, warps, yarns, and the like to the action of fluids or chemical solutions. Sept. 7.
- " 23,484 (1903). Scott. Printing, painting, or marking on cloth, and machinery therefor. Sept. 7.
- " 24,322 (1903). Perkin, and Whipp Bros. and Todd, Ltd. Treatment of raw cotton and flax, and cotton and linen goods, to reduce the inflammability thereof. Sept. 21.
- " 27,539 (1903). Calico Printers' Association, Ltd., and Garnett. Calico printing. Sept. 21.
- " 2062 (1904). Heuser. Yarn-dyeing vat, with device for throwing in and out of gear a windlass for lifting the material out of the colouring liquor. Sept. 14.
- " 13,302 (1904). O'Brien (L'Huillier). Dyeing, and apparatus therefor. Sept. 21.
- " 16,594 (1904). Hulse and Co., Ltd., and Shaw. Production of printed fabric, such as calico. Sept. 7.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

- [A.] 19,373. Lye and Lye. Dyeing or colouring straw and other materials capable of being similarly treated. Sept. 8.
- " 19,374. Lye and Lye. Apparatus for the dyeing or similar treatment of straw, straw plait, and similar materials. Sept. 8.
- " 19,989. Nusch (Sorel). Dyeing process of skins for glove making and other uses.* Sept. 16.
- [C.S.] 20,324 (1903). Ransford (Cassella and Co.). Production of two-coloured effects upon straw, or mixed straw and chip plaits. Sept. 7.
- " 23,583 (1903). Ransford (Cassella and Co.). Dyeing of leather. Sept. 7.

VII.—ACIDS, ALKALIS, AND SALTS.

- [A.] 18,710. Stead. Manufacture of carbon dioxide. Aug. 30.
- " 18,899. Polunowsky. Manufacture of alkali and alkaline earth carbonates, and apparatus therefor. Sept. 1.
- " 19,046. The Chalk Power Gas Syndicate, Ltd., and Pearson. See under II.
- " 19,174. Hargreaves. See under I.
- " 19,332. Elworthy, Thornt, and Fehr. Processes and apparatus for manufacturing carbonic acid and hydrogen. Sept. 7.
- " 19,442. Hargreaves. See under I.
- " 19,448. Craig, Brown, and Craig. Method of producing oxygen from atmospheric air. Sept. 9.
- " 19,571. Bloxam (Soc. Anon. d'Études Electro-Chimiques). Manufacture of lead peroxide. Sept. 10.
- " 19,606. Robinson. Process for the manufacture of sulphates. Sept. 12.
- " 19,924. Cie. des Prod. Chim. d'Alsai et de la Camargue. Manufacture of alumina. [Fr. Appl., Sept. 19, 1903.]* Sept. 15.
- " 20,012. Davis and Davis. Construction of plant for the manufacture of sulphuric acid. Sept. 16.
- [C.S.] 17,040 (1903). Heskett. Carbonic anhydride refrigerating machines. Sept. 14.
- " 24,332 (1903). Donnachie. Appliances for the manufacture of nitric acid. Sept. 14.
- " 24,619 (1903). Schwab, and H. Greene and Sons, Ltd. Manufacture of vitriol. Sept. 14.
- " 2739 (1904). Bellot des Minières. Apparatus for the manufacture of cupro-ammonium solution. Sept. 7.
- " 11,172 (1904). Cie. Franç. de l'Acetylene Dissous. Manufacture of oxygen. Sept. 7.

VIII.—GLASS, POTTERY, AND ENAMELS.

- [A.] 19,067. Baudoux. Glass-melting furnaces.* Sept. 3.
- [C.S.] 16,600 (1904). Good. Apparatus for the manufacture of glassware. Sept. 21.
- " 17,235 (1904). Robin. Composition for the manufacture of ceramic products. Sept. 12.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

- [A.] 18,699. Pryor. Wood-preserving composition. Aug. 30.
- " 18,804. Brunson. Composition of matter for artificial stone.* Aug. 31.
- " 18,837. Saunders. Manufacture of bricks and the like. Aug. 31.
- " 18,920. Lake (Matthey and Co.). Manufacture of electrical insulating and non-heat-conducting compositions. Sept. 1.
- " 18,930. Sellars. Manufacture of cement or cementitious substances. Sept. 2.
- " 18,939. Müller. See under XI.
- " 19,737. Boulton (Hülshberg and Co.). Impregnation of wood and other porous materials. Sept. 13.
- " 19,884. Morris and Chalmers. Manufacture of bricks and tiles. Sept. 15.
- " 19,912. Hamblet. Brick kilns and the like. Sept. 15.
- " 20,018. Ridley, Taite, and Williamson. Slag or scoria bricks or blocks, and method and apparatus for manufacturing the same.* Sept. 16.
- [C.S.] 19,676 (1903). Magens. Treatment of concrete and the like, whereby the setting of the same after mixture may be arrested. Sept. 7.

- [A.] 20,028 (1903). Sadler. Brick kilns. Sept. 21.
 „ 11,258 (1904). Stöffler. Fireproof quartz bricks or blocks. Sept. 14.
 „ 15,979 (1904). Schmidgen and König. Process for manufacturing a non-conductor of heat. Sept. 7.
 „ 16,987 (1904). Ryser. Building stone. Sept. 14.

X.—METALLURGY.

- [A.] 18,658. Bavy. Process for separating by flotation parts of the constituents of ores and other solid bodies from the remainder thereof. Aug. 29.
 „ 18,652. Bavy. Apparatus for separating by flotation parts of the constituents of ores and other solid bodies from the remainder thereof. Aug. 29.
 „ 18,660. Bavy. Process for separating by flotation zinc blende from ores, tailings, concentrates, and slimes, and for preparing such ores for such separation. Aug. 29.
 „ 18,674. Annable, Steinhardt, Vogel, and Tungsten Rare Metals Co., Ltd. Treatment of nickel ores. Aug. 29.
 „ 18,746. Goodsell. Method of and apparatus for treating sheet iron and steel.* Aug. 30.
 „ 18,977. Vanderlip. Ore concentration. Sept. 2.
 „ 19,053. Massenez. Manufacture of steel by the basic Bessemer process. Sept. 3.
 „ 19,140. Swyny and Plucknett. Ore separators and classifiers.* Sept. 5.
 „ 19,142. Swyny and Plucknett. Process for extracting normally buoyant mineral particles from slimes, tailings, and like metalliferous materials.* Sept. 5.
 „ 19,233. Guye. Treatment of lead sulphide, or ores thereof, to obtain volatile products. Sept. 6.
 „ 19,251. Thompson (Carlo, Tito, and Pollak and Rothschild). Alloy, and process for manufacturing the same. Sept. 6.
 „ 19,269. Rawson and Elmore. Process for extracting gold from solutions. Sept. 7.
 „ 19,394. Fyfe. Ore-roasting furnaces, and means for producing and depositing fumes from ores. Sept. 8.
 „ 19,464. Reinke. Process for briquetting friable ores. Sept. 9.
 „ 19,497. Turnbull. Apparatus for separating waterborne particles of varying density, such as finely divided ore, &c. Sept. 9.
 „ 19,555. Abelaspies. Ore concentrating and classifying apparatus. Sept. 10.
 „ 19,653. Ellis and Highton. Apparatus for extracting gold from slimes, tailings, or the like. Sept. 12.
 [C.S.] 12,727 (1903). Auchinachie. Manufacture of metallic vanadium from its ores or any other compounds of vanadium. Sept. 14.
 „ 19,226 (1903). Deutsch. Plunger-jig for treating ores. Sept. 14.
 „ 19,353 (1903). Lake (Sanfilippo). Ore-roasting and like furnaces. Sept. 21.
 „ 26,375 (1903). Michelis, Michelis, Kruse, and Kuhn. Process for hard-soldering aluminium. Sept. 7.
 „ 26,376 (1903). Michelis, Michelis, Kruse, and Kuhn. Process for hard-soldering cast iron. Sept. 7.
 „ 7309 (1904). Weiller and Weiller. Process for separating from their ores copper, silver, lead, mercury, and all other metals adapted to be precipitated from an acid solution by means of sulphuretted hydrogen. Sept. 21.
 „ 8216 (1904). Gin. *See under XI.*

- [C.S.] 13,328 (1904). Pelletier and Semprun. Solder for aluminium or aluminium alloys. Sept. 14.
 „ 16,419 (1904). Engels. Process for treating steel and armour plates. Sept. 14.
 „ 16,449 (1904). Fink-Huguenot. Process and apparatus for granulating or pulverising fused metals and alloys. Sept. 21.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

- [A.] 18,840. British Thomson-Houston Co., Ltd. (Gen. Electric Co.). Processes of electric deposition. Aug. 31.
 „ 18,920. Lake (Matthey and Co.). *See under IX.*
 „ 18,937. Hargreaves. Operating electrolytic cells. Sept. 2.
 „ 18,989. Müller. Insulating substance, and method of making same. Sept. 2.
 „ 19,266. Ziegenberg. Galvanic cell.* Sept. 6.
 „ 19,571. Bloxam (Soc. Anon. d'Études Electro-Chimiques). *See under VII.*
 „ 19,898. Blackburn. Primary batteries. Sept. 15.
 „ 20,003. Birkeland and Eyde. Process and furnace for subjecting solid materials to the action of the electric arc. [Appl. in Norway, Sept. 19, 1903.]* Sept. 16.
 [C.S.] 14,221 (1903). Dreiholz. Galvanic batteries. Sept. 7.
 „ 23,712 (1903). Nehmer. Manufacturing of dry batteries. Sept. 7.
 „ 8216 (1904). Gin. Electric furnace for converting pig iron into steel. Sept. 21.

XII.—FATTY OILS, FATS, WAXES, AND SOAP.

- [A.] 18,797. Nicholson and Shepherd. *See under V.*
 „ 19,043. Le Brocquy. Oils for lubricating gun barrels. Sept. 3.
 [C.S.] 23,010 (1903). Harvey. Manufacture of dry soap powders. Sept. 7.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, ETC.

(B.)—RESINS, VARNISHES.

- [A.] 19,252. Dunnett. Composition for preventing the incrustation and preserving the hulls of ships. Sept. 7.
 „ 19,583. Pugh, and Rudge Whitworth, Ltd. Application of varnishes and the like. Sept. 10.
 [C.S.] 17,135 (1903). Tixier and Rambaud. Process for the manufacture of varnishes by the direct solution of gums without previous fusion. Sept. 14.
 „ 21,020 (1903). Johnson (Foelsing). Apparatus for the treatment of products containing gums and resins, for the separation and obtainment of the gums and resins therefrom. Sept. 21.

(C.)—INDIA-RUBBER.

- [A.] 19,780. Owen and Threlfall. *See under XIX.*

XIV.—TANNING, LEATHER, GLUE, SIZE, ETC.

- [A.] 18,691. Jerret, Graham, and Blair. Leather-dressing composition. Aug. 30.*
 „ 19,244. Sonoff and Zwerckoff. Curing skins and hides. Sept. 6.
 „ 19,323. Petersen. Cleansing and dyeing gloves, skins, leather, and the like. [Appl. in Denmark, Sept. 9, 1903.]* Sept. 7.
 „ 19,779. Owen and Threlfall. Manufacture of leather. Sept. 14.
 „ 19,780. Owen and Threlfall. Manufacture of leather for use as a substitute for india-rubber and for other purposes. Sept. 14.

- [A.] 19,989. Nusch (Sorel). *See under VI.*
 [C.S.] 18,677 (1903). Muir. Treatment of skins or hides anterior to and during the process of tanning. Sept. 7.

XVI.—SUGAR, STARCH, GUM, Etc.

- [[C.S.] 26,799 (1903). Lafeuille. Annular moulds for treating sugar by centrifugal action. Sept. 21.

XVII.—BREWING, WINES, SPIRITS, Etc.

- [A.] 19,597. Hunt. Manufacture, purifying, and maturing or flavouring of spirit. Sept. 10.
 [C.S.] 19,645 (1903). Monti. Treatment of wine, must, beer, beetroot juice, and the like, and apparatus therefor. Sept. 14.
 „ 21,294 (1903). Jensen (Diesler). Process for freeing yeast extracts from bitter principles. Sept. 14.
 „ 28,264 (1903). Plischke and Beschorner. Malting apparatus. Sept. 7.
 „ 14,028 (1904). Schneible. Art of brewing. Sept. 21.
 „ 15,370 (1904). Boulton (Pabst Brewing Co.). Pasteurising apparatus. Sept. 7.

XVIII.—FOODS; SANITATION, WATER PURIFICATION; & DISINFECTANTS.

(A.)—FOODS.

- [A.] 18,906. Ross. Production of foods for animals.* Sept. 1.
 „ 19,082. Cornthwaite. *See under XXIII.*
 „ 19,676. Bell. Process for preserving flesh meat and other foodstuffs. Sept. 13.
 [C.S.] 9684 (1904). Maggi. Manufacture of milk powder. Sept. 21.

(B.)—SANITATION; WATER PURIFICATION.

- [A.] 19,444. Adams. Filter beds for sewage or other purposes. Sept. 9.
 „ 20,031. Gaskell and Day. *See under I.*
 [C.S.] 19,599 (1903). Adams and Springborn. System for the purification of sewage and other fluids. Sept. 7.
 „ 19,644 (1903). Talbot. Means for purifying air. Sept. 21.
 „ 17,307 (1904). Walter. Water purifying apparatus. Sept. 14.

(C.)—DISINFECTANTS.

- [C.S.] 18,678 (1903). Maller. Insecticide. Sept. 7.
 „ 19,837 (1903). Kösters. Process for forming solutions of antiseptics which are otherwise insoluble or not easily soluble. Sept. 21.

XIX.—PAPER, PASTEBOARD, Etc.

- [A.] 18,742. Kraus and The Bradford Dyers' Association, Ltd. Manufacture and application of nitro-cellulose solutions. Aug. 30.
 „ 19,178. Beadle and Stevens. Manufacture of blotting and other water-leaf papers. Sept. 6.

- [A.] 19,310. Thiebaut. Manufacture of paper, cardboard, and the like. Sept. 7.
 [C.S.] 11,233 (1904). Noyes and Krueger. Machines for coating paper and like materials. Sept. 7.
 „ 16,403 (1904). Nebrich. Pulp strainers for paper manufacture. Sept. 7.
 „ 17,232 (1904). Hpmberger. Method of imparting lustre to objects made of celluloid or the like. Sept. 14.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

- [A.] 18,825. Newton (Bayer and Co.). Manufacture of a pharmaceutical compound. Aug. 31.
 „ 19,411. Zimmermann (Chem. Fabr. auf Actien, vorm. E. Schering). Manufacture of dialkylated barbituric acids. Sept. 8.
 „ 20,071. Wetter (J. D. Riedel). Pharmaceutical compounds having the therapeutic properties of codeine, and processes for the manufacture of the same. Sept. 17.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

- [A.] 18,890. Von Garainow-Trauttenberg and Fabian. Method of production of photographic paper and the like. Sept. 1.
 „ 19,940. Smith. Photographic plates or films. [Ger. Appl., Sept. 17, 1903.]* Sept. 16.
 [C.S.] 25,144 (1903). Newton (Bayer and Co.). Manufacture of new sensitising dyestuffs and intermediate products for use therein. Sept. 7.
 „ 17,009 (1904). Lake (Jacobsen). Photographic reproductions. Sept. 14.
 „ 17,036 (1904). Lake (Jacobsen). Photographic reproductions. Sept. 14.
 „ 17,610 (1904). Schmidt. Pigment photographic processes. Sept. 21.

XXII.—EXPLOSIVES, MATCHES, Etc.

- [A.] 19,200. Hall. Manufacture of explosives. Sept. 6.
 „ 20,106. Evangelidi. Explosives.* Sept. 17.
 [C.S.] 23,766 (1903). Unge. Slow-combustion compositions for fuses, self-propelling explosive projectiles, and the like. Sept. 7.
 „ 11,000 (1904). Steel. Explosive. Sept. 21.
 „ 12,627 (1904). Hough. Nitrated carbohydrates. Sept. 7.

XXIII.—GENERAL ANALYTICAL CHEMISTRY.

- [A.] 19,082. Cornthwaite. Soxhlet extractors for analysis of milk, cereals, cattle foods, &c. Sept. 5.
 „ 19,337. Decker. Goniometers or similar instruments. Sept. 7.
 [C.S.] 15,706 (1904). Thompson (Verein. Maschinenfabr. Augsburg und Maschinenbauges. Nürnberg A.-G.). Method for the continuous determination of the hydrogen contents of gaseous mixtures, and apparatus therefor. Sept. 7.

being in the passive condition if, when brought into contact with fuming nitric acid, it has not been perceptibly acted upon after 10 seconds. Immediately below the critical point there is a zone of temperature, extending over about 10° , wherein a metal may behave as if it were in either the passive or active condition, according to external conditions. For example, iron plate can be heated with nitric acid to over 90° C. before its passivity is destroyed, yet if the plate and the acid be heated separately and then brought in contact, a vigorous evolution of gas occurs at 75° C. The critical temperature also varies with the purity of the metal.—A. S.

Ammonium Salts and Metals; Some Reactions between — W. R. Hodgkinson and A. H. Coote. Brit. Assoc., 1904. Chem. News, 1904, 90, 142.

THE action of ammonium nitrate, both in aqueous solution and in the fused condition, on some metals was examined. Except on cadmium, the rate of action of the aqueous solution and of the fused salt differed notably. Cadmium dissolves rapidly in an ice-cold saturated solution of ammonium nitrate, without evolution of gas. The solution gives off nitrogen only when heated to 100° C., when the cadmium ceases to dissolve. It contains a little free ammonia, and, apparently, the nitrite of cadmium and ammonium, since the cadmium can be completely precipitated by means of a current of carbon dioxide, leaving a solution containing mainly ammonium nitrite. Zinc and magnesium act in a similar manner, but more slowly and to a less extent, owing to the formation of somewhat insoluble double ammonium compounds. Aluminium, iron, mercury, and silver are not acted upon by an aqueous solution of ammonium nitrate. Nickel, copper, and lead are affected to a slight extent, lead becoming coated with a somewhat insoluble nitrite. Fused ammonium nitrate has no action on iron, mercury, or aluminium, but silver is acted upon slightly by the salt, when the latter is heated so strongly as to decompose, with formation of red fumes. When ammonium nitrate is just fused, it acts upon the following metals at rates about in the order given:—Cadmium, magnesium, zinc, copper, nickel, lead, bismuth. Weighed quantities of metals were allowed to act upon ammonium nitrate in a vacuum-tube maintained at the melting point of the salt. In the cases of cadmium and copper, the gas collected was pure nitrogen, the amounts corresponding to a little less than 4 atoms of nitrogen to 1 atom of cadmium, and nearly 3 atoms of nitrogen to 2 atoms of copper. The deficit of nitrogen may be due to the liberation of ammonia which takes place during the first phase of the reaction.

Powdered cadmium dissolves in a solution of aniline nitrate, and if the temperature be kept below 10° C., no appreciable evolution of gas occurs, and a considerable yield of diazoaminobenzene is obtained. The course of the reaction is very similar to that with the ammonium salt, a little aniline being liberated in the first instance.—A. S.

Gold and Silver in Zinc Ores; Crucible Charges for Determination of — E. J. Hall and E. Popper. XXIII., page 952.

Platinum-Gold-Silver Alloys; Analysis of — Hollard and Bertiaux. XXIII., page 952.

ENGLISH PATENTS.

Ingot Iron and Steel; Manufacture of — B. Talbot, Leeds. Eng. Pat. 22,767, Oct. 21, 1903.

THE pig iron and scrap employed are converted in a single furnace having two or more independent hearths, being first treated on a basic hearth, and finished on an acid-lined hearth. Briquettes of iron ore with carbon may be placed on the fore-hearth of the melting furnace, and, when heated, be pushed forward into the hearth proper, to be there treated with suitable additions of lime and iron oxide to eliminate phosphorus and silicon. The charge is preferably tapped from this to the refining hearth while it still contains about 2 per cent. of carbon. The finishing hearth may be worked, if desired, on the continuous system, with a permanent bath of metal.—E. S.

Cast-Iron; Process for Refining —, and **Apparatus therefor**. H. Harmet, St. Etienne, France. Eng. Pat. 16,448, July 23, 1901. Under Internat. Conv., Aug. 28, 1903.

SEE Fr. Pat. 334,892 of 1903; this J., 1904, 119.—T. F. B.

Zinc; Treatment of — P. and A. Gührs, Berlin. Eng. Pat. 23,145, Oct. 26, 1903.

SEE Addition, of Aug. 31, 1903, to Fr. Pat. 332,657 of 1903; this J., 1904, 191.—T. F. B.

UNITED STATES PATENTS.

Values [Precious Metals]; [Amalgamating] Apparatus for Recovering — from Sand or Dirt. C. M. Poppenberg, Brainard, Minn., Administratrix of C. G. Poppenberg. U.S. Pat. 768,624, Aug. 30, 1904.

A CASING is provided with upper and lower discharge spouts, the lower one communicating with a basin, above which is a series of mercury-holders, suspended by lugs from ledges of the opposite casing walls. The holders are arranged set above set, and have depressions with sharp edges, the spaces between which permit downward passage of the sand, &c., into deflectors below each set of holders. Above the chamber containing the mercury-holders is another chamber the floor of which has numerous minute discharge apertures; a screen above rejects any particles which are too large, and "rocks" are rejected by a grating above the screen, both sets of coarse particles being passed into the upper spout under pressure from fluid admitted to the chamber.—E. S.

Precious Metals; Method of Extracting — from their Ores. S. C. C. Currie, Assignor to W. Courtenay, New York. U.S. Pat. 769,254, Sept. 6, 1904.

ORES containing precious metals and sulphur are heated in hydrogen, then roasted, the roasted ore digested in a hot caustic alkali solution, after freeing from which it is chlorinated, and the solution of chlorides obtained precipitated by the hydrogen sulphide obtained in the first stage of the process. The residuum is treated with sodium thiosulphate. The alkaline solution resulting from washing the roasted ore with a caustic alkali solution is treated with hydrogen sulphide and then used again.—E. S.

Gold; Process of Extracting — from Ores, &c. H. S. Stark, Johannesburg. U.S. Pat. 769,280, Sept. 6, 1904.

CRUSHED pyritic auriferous ores are treated with a solution of an alkali thiocyanate (sulphocyanide), in presence of an oxidising agent (including atmospheric oxygen), and the gold dissolved by the nascent cyanogen, and the hydrocyanic acid set free, are recovered. The residue of the treatment of such ores by the ordinary cyanide solution, are oxidised, to set gold free and to produce in the mass thiocyanate and thiosulphate of an alkali metal or metals, and by addition of a quantity of water in presence of air, a solution is formed by which the gold is dissolved. Or, pyritic residues of the cyanide treatment are oxidised, leached with water containing a thiocyanate, and re-leached repeatedly with the same liquor after successive extractions of the gold.—E. S.

Precious Metals; Process of Extracting — from Ores or Slimes. H. R. Cassel, New York. U.S. Pat. 769,938, Sept. 13, 1904.

THE process consists in adding solutions of a bromide and of a cyanide to the ore, and passing chlorine gas through the mixture to evolve bromine, and form solvents for the precious metals. Finally, the bromine is reconverted into bromide. See U.S. Pats. 732,708 and 732,709 of 1903; this J., 1903, 915.—E. S.

Tilting Metallurgical Furnace. J. A. Potter, Pittsburg, Pa. U.S. Pat. 769,712, Sept. 13, 1904.

AT opposite ends of a furnace, which can be tilted endwise, are regenerators running on tracks in the line of the longitudinal axis of the furnace. Ports in the ends of the furnace communicate with ports in the regenerators. A

receptacle is arranged below one end of the furnace and means are provided for tilting the furnace below the ports, so as to pour at least a part of the bath from the end port into the receptacle.—E. S.

FRENCH PATENTS.

Steel; Manufacture of — J. Vernon. Fr. Pat. 342,412, April 18, 1904.

SEE Eng. Pat. 1966 of 1903; this J., 1904, 609.—T. F. B.

Chrome-Nickel Steel; Manufacture of Cemented Pieces of — A. De Dion and G. Bouteu. Fr. Pat. 342,591, April 23, 1904.

PIECES of chrome-nickel steel, containing, say, from 1 to 3 per cent. of chromium, and from 4 to 6 per cent. of nickel, with 0.12 per cent. of carbon, receive by simple cementation, without hardening, great superficial hardness. See Fr. Pat. 342,061 of 1904; this J., 1904, 903.—E. S.

Armour Plates and Projectiles; Manufacture of — F. C. Fairholme and J. E. Fletcher. Fr. Pat. 342,614, April 25, 1904.

SEE Eng. Pat. 1850 of 1903; this J., 1904, 609.—T. F. B.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(A.)—ELECTRO-CHEMISTRY.

Carbon Primary Cell. F. Haber and L. Bruner. Z. Elektrochem., 1904, 10, 697—713.

THE chemical and physical changes occurring in the carbon cell, carbon-fused caustic soda-iron, have never been fully explained, despite the great economic importance of the subject. The authors have carried out a long series of experiments, and show that this cell must no longer be considered as a primary cell with carbon as the source of E.M.F., but rather as an oxygen-hydrogen gas-cell. The iron electrode becomes passive in fused caustic soda, the presence of manganate assisting the change, and in this form is a well-defined oxygen electrode, the oxygen being supplied from the air. On the other hand, both carbon and carbon monoxide react rapidly with fused caustic soda, producing sodium carbonate and hydrogen, and it is this hydrogen alone which causes and conditions the E.M.F. at the carbon. Careful measurements were made of the potential at both the oxygen and hydrogen electrodes under varied conditions. The authors consider that their results will be sufficiently definite to show that there is no hope of the application of this cell.—R. S. H.

Films on Aluminium Anodes; Electrical Properties of — W. R. Mott. Electrochem. Ind., 1904, 2, 352—355.

TAKING the thickness of film previously calculated by the author (this J., 1904, 792), the specific resistance in phosphate and sulphate solutions is found to be 16.0×10^{10} ohms and 0.8×10^{10} ohms per c.c. respectively. The specific resistance of the solid film decreases as a logarithmic function of the temperature. The critical voltage and current for any aluminium anode is defined as the voltage and current at which the heating effect can just be balanced by the cooling effects; above the critical point the characteristic behaviour of the aluminium electrode disappears. The dielectric strength of films formed with phosphate solutions is calculated as one million volts per centimetre.—R. S. H.

Anodic Oxygen Evolution. F. Foerster and A. Piguët. Z. Elektrochem., 1904, 10, 714—721.

IN using polished platinum electrodes Foerster and Mueller found that, as the electrolysis continued, the potential of the anode rose slowly from that at which oxygen was first given off, until it attained a considerably higher value, although the current was kept constant (this J., 1902, 1235). The present authors have carried out a number of experiments to investigate this problem, and have used

different metals as electrodes. The effect is observed in both alkaline and acid solutions, but varies considerably with the particular metal employed and with the conditions of experiment. With high current density and a low temperature the rise of potential is greatest. The only explanation which the authors consider satisfactory is that put forward by Haber, who assumes that during electrolysis some of the evolved gases become adsorbed by the electrodes and thus form a layer around them. The actual thickness of this layer will, of course, vary according to the experimental conditions, but the rise of potential and the properties of such a layer seem to be in agreement in all the cases considered.—R. S. H.

Copper Sulphate Solutions; Electrolysis of — F. Foerster and G. Coffetti. Z. Elektrochem., 1904, 10, 736—741.

RECENT observations have shown that a measurable current can be passed between a platinum cathode and an anode in copper sulphate solutions at as much as 0.1 volt below the potential of metallic copper, i.e., below the point at which copper can first be deposited. The authors prove that this is due to the reduction of cupric to cuprous ions, $\text{Cu}^{++} + \ominus \rightarrow \text{Cu}^+$. At ordinary temperatures, since the concentration of cuprous ions is limited to a low value, the experimental realisation is difficult, but at 90° and 70° C. currents of $1.6 \cdot 10^{-3}$ amp. per sq. cm. and $0.85 \cdot 10^{-3}$ amp. per sq. cm. respectively can be maintained without causing the deposition of metallic copper. In neutral solutions cuprous oxide, produced by hydrolysis, is deposited at the cathode, and the oxidation of the cuprous salt by the air, which also occurs in acid solutions, further tends to restore the equilibrium between the cuprous and cupric ions.

—R. S. H.

Potassium Acetate; Electrolysis of — F. Foerster and A. Piguët. Z. Elektrochem., 1904, 10, 729—736.

IN addition to the formation of carbon dioxide and ethane at the anode and hydrogen at the cathode, it has for long been known that secondary reactions lead to the production of ethylene, methyl acetate, and oxygen at the anode. The authors have investigated the electrolysis, so far as it is influenced by different metallic anodes, by the potential at the anode and by the use of alkaline solutions. The yield of ethane is also lowered by electrolytic oxidation of acetic acid to carbon dioxide and, to a small extent, to carbon monoxide. With iron and palladium anodes the evolution of oxygen predominates, corresponding to the low potential observed in these cases. With platinum electrodes the potential is found to be higher, and here, with increasing current density, the evolution of oxygen diminishes and the oxidation of acetic acid increases. Finally, with bright platinum and iridium anodes, both the potential and yield of ethane are greater. In alkaline solutions the yield is always lower than in the corresponding neutral salt on; this appears to be due to the prevention of the formation of layers of acetic acid around the anode. The authors in the view of Jahn that the production of ethane is due to the electrolytic oxidation of acetic acid, $2\text{CH}_3\text{CO}_2\text{H} + \ominus = \text{C}_2\text{H}_6 + 2\text{CO}_2 + \text{H}_2\text{O}$.—R. S. H.

Electrolysis with Rotating Cathode. H. E. Medway. XXIII., page 952.

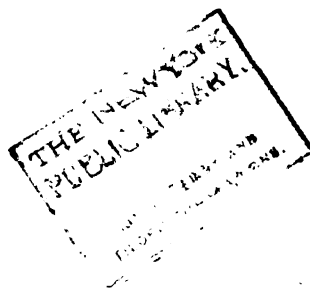
ENGLISH PATENTS.

Plates for Secondary Batteries. W. P. Thompson, London. From Püßiger Accumulatoren-Werke, Act.-Ges., Berlin. Eng. Pat. 24,626, Nov. 12, 1903.

SEE Fr. Pat. 336,549 of 1903; this J., 1904, 377.—T. F. B.

Galvanic Battery; Improved High-voltage — L. De Gournay, Paris. Eng. Pat. 14,066, June 21, 1904.

A POROUS vessel containing a perforated, corrugated, and amalgamated zinc plate, and filled with a concentrated solution of aluminium sulphate, is placed within a thin perforated leaden vessel, the intervening space being filled with "electrolytically agglomerated" lead peroxide. The double vessel is placed within a receptacle, charged with water acidulated with sulphuric acid. The battery leads



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are attached to the zinc and lead electrodes by rivets and a solder of antimonial lead. The liquid in the inner cell may be "fixed" by sulphuric acid, or cellulose, gelatinous silica, &c., and the acidulated water by such absorbents as cellulose, silica, gelatinous alumina, or the like. If the liquid in the inner cell is kept "free," the amalgamated zinc is wrapped in canvas, to retain the mercury on the plate. Such cells may be combined as desired. For a voltaic grouping of several elements in the same receptacle, these are arranged in tightly fixed partitions in the following order: amalgamated zinc, aluminium sulphate solution, a porous partition, lead peroxide, perforated sheet of lead, acidulated water, and sheet of lead not perforated, forming a body with a sheet of amalgamated zinc, and so on. The amalgamated zinc may be replaced by an alloy of zinc with sodium or potassium.—E. S.

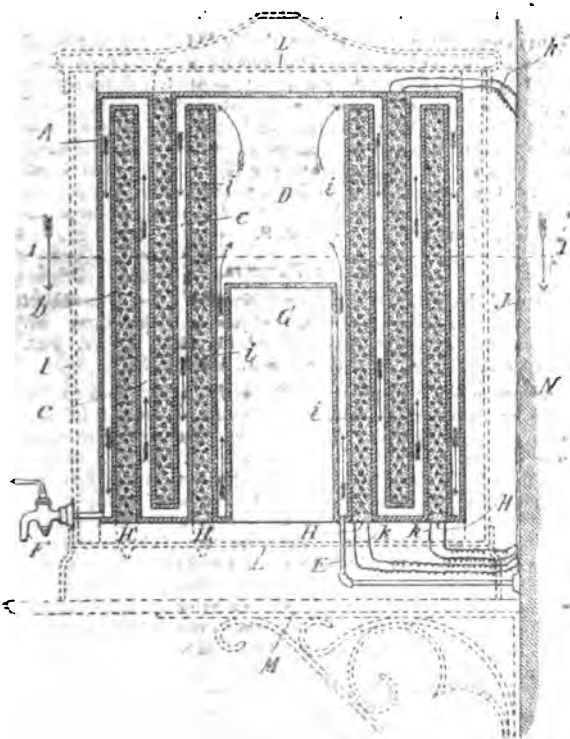
UNITED STATES PATENT.

Electrolytic Meter.—H. J. Wood, Shenectady; Assignor to General Electric Co., New York. U.S. Pat. 770,882, Sept. 13, 1904.
See Eng. Pat. 7587 of 1903; this J., 1904, 493.—T. F. B.

FRENCH PATENTS.

Electrically Heating Liquids; Apparatus for — E. R. Waterman. Fr. Pat. 342,806, May 3, 1904.

THE liquid to be heated enters the apparatus by the pipe E, circulates, in the direction shown by the arrows, around the



heating devices H H, and is drawn off at F. The heating is effected by wire resistance coils, embedded in asbestos, and contained in the concentric cylinders H H. G is a closed air space, and D a liquid space to accumulate a body of heat in order to maintain, in some degree, the temperature of the liquid after the current has been cut off. The whole is enclosed in the outer casing L, to shield it from air currents and prevent too rapid radiation.—W. H. C.

Ozone; Apparatus for the Production of — B. J. X. Gosselin. Fr. Pat. 342,295, April 14, 1904.

To a horizontal tube, a metallic piece, annular in cross-section, and having numerous projecting arms or wings,

is secured by tinfoil, or amalgamated metal, this short encircling, metallic piece embracing the longer horizontal tube at its middle. Within the tube a somewhat longer tube, the middle portion of which is enlarged, is sealed at both ends, so that the open ends of the enclosed tube project outwards. There are two apertures in the periphery of the enclosing tube to admit passage of a current of the air, to be ozonized. The enclosed tube receives through it a flow of water, to which one of the electrodes of a source of electricity is connected, the other electrode being connected to the surrounding metal piece. A glass cap, with opening to admit of passage over the main tube, is connected at right to each end, and is fitted to the extreme wing on either side of the metal piece. An aperture on the side of each cap admits air to maintain the circulation.—E. S.

(B).—ELECTRO-METALLURGY.

Complex Sulphide Ores; Electrolytic Production of Zinc and Lead from — C. H. Barleigh. Electrochem. Ind., 1904, 2, 355—357.

THE finely crushed ore is very carefully roasted, since the subsequent extraction depends upon having as much as possible of the ore in the form of oxide and the remaining sulphur as sulphide rather than sulphate. The extraction of the zinc and lead is effected with a hot solution of "soda" of 25 to 40 per cent. strength. In this way all the lead and 85—95 per cent. of the zinc is extracted. The residue, containing iron, copper, gold, silver, and gangue can be treated with cyanide or by some smelting process. The solution of zinc and lead is electrolysed at first with a low potential (1.5 to 1.7 volts) to deposit lead and then at 2.5 to 7 volts, when the zinc can be recovered in a coherent form with a 95 per cent. efficiency.—R. S. H.

ENGLISH PATENTS.

Aluminium; Process for Hard-Soldering — C. and L. Michélis, C. Kruse, and O. Kuhn, Hanover. Eng. Pat. 26,375, Dec. 2, 1903.

SILVER is first electro-deposited on those parts of the aluminium which are to be soldered, and a hard solder is then used. Such a solder, corresponding very nearly to the colour of aluminium, may be composed of equal parts by weight of brass, zinc, and aluminium; or, a tougher one could be formed of 10 parts each of silver and brass, 14 parts of aluminium, 2 parts of copper, and 4 parts of zinc.—E. S.

Cast Iron; Process for Hard-Soldering — C. and L. Michélis, C. Kruse, and O. Kuhn, Hanover. Eng. Pat. 26,376, Dec. 2, 1903.

AFTER thoroughly cleaning the parts to be joined, they are electro-coated with copper in an alkaline copper bath. The subsequent soldering or brazing may be effected with the usual solders.—E. S.

UNITED STATES PATENTS.

Electric Furnace.—M. R. Conley, Assignor to Electric Furnace Co., New York. U.S. Pat. 769,250, Sept. 6, 1904.

THE furnace consists of a receptacle of like cross-sectional area at top and bottom, composed of resisting material adapted to become incandescent on the passage of an electric current through it. The receptacle has "integral extensions" at each side, with which a series of arms, of greater electrical conductivity than the receptacle, can be connected in different planes, each arm being provided with a switch so that the distribution of the electricity through the furnace can be controlled.—E. S.

Electro-plating Machine.—J. Bailey, Walsall. U.S. Pat. 770,148, Sept. 13, 1904.

See Eng. Pat. 15,735 of 1902; this J., 1903, 306.—T. F. B.

FRENCH PATENT.

Metals [of the Rare Earths]; Process and Apparatus for Obtaining — in a Pure State. Elektroden Ges. Fr. Pat. 842,581, April 23, 1904.

THE process is for the preparation of metals fusible with difficulty, especially those of the rare oxides, such as thorium and zirconium. The oxide of the metal is intimately mixed with excess of magnesium, potassium, or other suitable metal, and the mixture heated in an atmosphere of hydrogen or nitrogen, the heat of the reaction being supplemented, not only externally, but by the electric current. The furnace consists of a horizontal cylinder of refractory material, with a central bore from end to end, each end being occupied by a closely fitting electrode. A vertically ascending tube near one end, and a vertically descending tube at the opposite end, both valved, permit passage of gases.—E. S.

XII.—FATTY OILS, FATS, WAXES, AND SOAP.

Iso-erucic Acid. G. Ponzio. *Gaz. chim. ital.*, 1904, 34, 50—55. *Chem. Centr.*, 1904, 2, 693.

THE author prepared erucic acid by saponifying colza oil, freeing it from arachidic acid by treatment with glacial acetic acid, in which the arachidic acid is insoluble. The erucic acid was converted into iodohebenic acid by treatment with phosphorus tri-iodide, and from this, iso-erucic acid (m. pt. 54° C.) was obtained by the action of alcoholic potassium hydroxide solution. When iso-erucic acid is oxidised by means of nitric acid, it yields nonylic acid, $C_9H_{17}CO_2H$, and brassylic acid, $CO_2H(CH_2)_{11}CO_2H$, whilst its dibromide when treated with alcoholic potassium hydroxide solution is converted into behenoleic acid, $CH_3(CH_2)_7C : C(CH_2)_{11}CO_2H$. These reactions show that iso-erucic acid has the double linking not between the first and second carbon atoms from the carboxyl group as stated by Alexandroff and Saytzeff (*J. russ. phys.-chem. Ges.* 24, 486), but between the thirteenth and fourteenth carbon atoms, and that it consequently has the same structural constitution as erucic acid, $CH_3(CH_2)_7CH : CH(CH_2)_{11}CO_2H$.—A. S.

Oleic Acid Series; New Acids of the —. G. Ponzio. *Gaz. chim. ital.*, 1904, 34, 77—85. *Chem. Centr.*, 1904, 2, 693—694.

THE higher members of the $C_{2n}H_{4n}O_2$ series of acids with the double linking in the 1.2-position can be prepared from the α -iodo-derivatives of the corresponding saturated acids, e.g., palmitic, stearic, arachidic, and behenic acids by treatment with alcoholic potassium hydroxide solution. The hitherto unknown 2.3-oleic acid, $CH_3(CH_2)_7CH : CH.CO_2H$, was obtained by converting stearic acid into its α -bromo-derivative by treatment with phosphorus and bromine, preparing the corresponding iodo-derivative by heating the bromine compound with alcoholic potassium iodide solution, and then boiling the iodine compound for six hours with alcoholic potassium hydroxide solution. A mixture of 2.3 oleic and α -hydroxystearic acids was obtained. The 2.3-oleic acid melts at 59° C. and re-solidifies at 52° C.; it is easily soluble in ether and chloroform, slightly soluble in cold alcohol and soluble in light petroleum spirit. When fused with potassium hydroxide, it yields palmitic and acetic acids. The sodium, calcium, barium, and silver salts, the ethyl ester, the amide, and the dibromide (2.3-dibromostearic acid) of the acid were prepared. The author considers that in an analogous manner to iso-erucic acid (see preceding abstract), the iso-oleic acid described by Saytzeff (*J. prakt. Chem.*, 1888, 37, 269), has probably the same structural constitution as oleic acid.—A. S.

Oil of Safflower (Carthamus tinctorius). G. Fendler. *Chem.-Zeit.*, 1904, 28, 867—868.

THE seeds of this plant (from German East Africa) are pear-shaped, 6—8 mm. long, 4—5 mm. maximum breadth. Thin, hard, shining greyish or yellowish-white husks enclose

a very soft, greenish-white seed. 100 seeds weigh 5.2 grms., of which the weight of the husks is 2.4 grms., and that of the kernels 2.8 grms. Ether extracts from the whole seeds 25.8 per cent., from the kernels 50.37 per cent. of fat. The oil, obtained by percolation with ether and evaporation of the ether, is golden yellow and almost inodorous, but quickly acquires a very disagreeable rancid flavour. The following constants of the oil, and of the fatty acids obtained from it (5.84 per cent. reckoned as oleic acid, corresponding to an acid value of 11.63), were determined. Oil:—sp. gr. at 15° C., 0.9266; m. pt., —5° C.; solidification point, begins at —13° C., incomplete even at —18° C.; saponification value, 191; iodine value (Hübl), 142.2; unsaponifiable matter, 0.708 per cent.; butyro-refractometer reading at 40° C., 65°. Fatty acids:—sp. gr. at 15° C., 0.9135; m. pt., 17° C.; solidification point, 12° C.; acid (saponification) value, 199; mean molecular weight, 281.8; acetyl-acid value, 154.4; acetyl value, 52.9; acetyl-saponification value, 207.4; iodine value (Hübl), 148.2; iodine value of liquid acids, 150.8; acid (saponification) value of liquid acids, 191.4; mean molecular weight of liquid acids, 293.1. In a thin layer, the oil dried completely at the ordinary temperature within six days; more rapidly at a higher temperature. The oxygen absorbed, by Livache's test, was after 18, 40, 64, 136 hours respectively 0.6, 4.3, 6.4, 7.5 per cent. The oil is not suitable for food, but will be useful for soap-making, and in the manufacture of varnishes.—J. T. D.

ENGLISH PATENT.

Soap Powders; Manufactures of Dry —. C. Harvey. London. Eng. Pat. 25,010, Nov. 17, 1903. ✓

ORDINARY hard soap is automatically fed into a series of high speed disintegrators. The ground soap is then conveyed by means of spirals or worms to another disintegrating machine where it is mixed with automatically measured quantities of crystallised sodium carbonate, anhydrous boric acid, boron nitride and ammonium chloride. The following proportions of ingredients are specified: desiccated hard soap, 28 parts; sodium carbonate (crystals), 69 parts; anhydrous boric acid, boron nitride, and ammonium chloride, of each 1 part.—W. P. S.

FRENCH PATENTS.

Oils and Fats; Enzymic Saponification of — without introducing Appreciable Quantities of Impurities. M. Nieloux. Addition, dated April 11, 1904, to Fr. Pat. 335,902, Oct. 14, 1903 (see this J., 1904, 327). ✓

VARIOUS methods of preparing the active agent from castor seeds are claimed in addition to those described in the main patent (*loc. cit.*). Thus the crushed seeds or seed cake may be treated with cotton-seed oil, which is subsequently filtered through silk, yielding a very active filtrate. Or, instead of filtration, centrifugal force may be employed, and the supernatant oil will then require only the addition of acidified water for direct saponification. Or benzene or other solvent may be added to the filtered oil before using centrifugal force. Again, the castor-seed cake may be treated with benzene, &c. and the supernatant liquid separated and evaporated. Or the crushed grain may be treated with hot castor oil, which is filtered through fabric and allowed to stand at 90° to 90° C., when aleurone is deposited, whilst the active agent left in suspension may be separated by treatment with benzene and centrifugal force. Other combinations of these different methods are also described. To prepare an active dry substance a large excess of solvent is used, and the deposit separated from this in the centrifugal machine treated with a fresh portion of solvent and again separated. This dry deposit requires to be suspended in oil before use.—C. A. M.

Soap; Manufacture of —. F. A. V. Klopffer. Fr. Pat. 342,691, April 27, 1904. ✓

A CERTAIN proportion of wheat gliadin and glutenin is added to the soap during the manufacture, with the object of combining with free alkalis and rendering them innocuous without introducing the drawbacks of superfatted soaps (tendency to become rancid, &c.).—C. A. M.

Soap; Manufacture of a Floating — F. W. Zimmermann and A. A. Stöhr. Fr. Pat. 342,750, April 30, 1904.
 SEE Eng. Pat. 13,451 of 1904; this J., 1904, 871.—T. F. B.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(A.)—PIGMENTS, PAINTS.

FRENCH PATENTS.

Vehicles for Colouring Matters in the Manufacture of Pigments; Production of — E. H. Strange and E. Graham. Fr. Pat. 342,327, April 2, 1904. Under Internat. Conv., April 11, 1903.

SEE Eng. Pat. 8335 of 1903; this J., 1904, 448.—T. F. B.

Calcium Sulphate and Carbonate occurring as Residues in the Manufacture of Caoutchouc Goods, Colours, Ceramic Ware, and Cement Blocks, and in other Chemical Industries; Utilisation of — A. Morin. Fr. Pat. 342,797, May 2, 1904. IX., page 937.

(B.)—RESINS, VARNISHES.

UNITED STATES PATENT.

Turpentine Still. J. F. Bailey, Valdosta, Ga.
 U.S. Pat. 770,149, Sept. 13, 1904.

A DISTILLATION apparatus is claimed which consists of a distillation tank and a condensing coil immersed in water. The still is heated by a series of steam pipes extending transversely through it, and having their projecting ends connected with "headers" on opposite sides of the tank. With one of these "headers" a boiler supplying steam is connected, and with the other a steam pump for forcing water both into the cooling vat and the steam boiler, with the necessary valves for controlling the flow of steam and water.—M. J. S.

FRENCH PATENT.

Resinous Products [Turpentine]; Apparatus for the Distillation of — G. Col. Fr. Pat. 342,425, April 18, 1904.

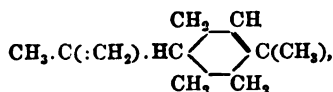
THE apparatus consists of a cylinder of wrought iron inclined at a suitable angle to the horizontal. Its walls form two concentric envelopes so arranged that there are no rivets or joints in the inner wall, and all chance of leakage is thus prevented. The inner chamber has an inlet tube for the introduction of material, and an outlet for the escape of vapours into the condenser, and is heated by means of a steam coil at the bottom. A door at the end, kept closed by means of a screw, permits the introduction of an open vessel beneath the inlet tube. The material falls into this and leaves behind the ligneous impurities, &c., which are thus dried separately, obviating the danger of spontaneous combustion, which may take place when such impurities are carried over with turpentine vapour into the condenser, as in the methods of dry distillation.—C. A. M.

(C.)—INDIA-RUBBER, &c.

Caoutchouc; Pyrogenic Decomposition of — R. Dittmar. Gummi-Zeit., 1904, 18, 1013—1016, 1038—1041, 1058—1061.

THE author gives a detailed review of the investigations which have been made with regard to the nature of the products of the destructive distillation of caoutchouc. He concludes that the pyrogenic decomposition of caoutchouc may be regarded as proceeding in the following manner: The large caoutchouc molecule is in the form of an open chain. The polyprene decomposes primarily into a series of aliphatic terpenes with long open chains, which then split into compounds with short chains, the lowest member of the series being isoprene, $\text{CH}_2\text{C}(\text{CH}_3)\text{CH}=\text{CH}_2$. These open-chain compounds polymerise and form dipentene, and sesqui-, di-, and poly-terpenes of a cyclic nature. The formation of open-chain and of cyclic compounds almost certainly

proceeds simultaneously, and one can scarcely hope to be able to arrest the decomposition of the caoutchouc at a point where only aliphatic terpenes have been produced. The author refers to numerous errors which occur in the literature of the subject with regard to caoutchine, $\text{C}_{10}\text{H}_{16}$, owing to confusion of the compound with the caoutchene discovered by Boucardat, and also to the custom of calling it di-isopene. Caoutchine is really a cyclic terpene—



and, to prevent further confusion, the author proposes the name dipentene for it. A bibliography is appended to the paper.—A. S.

India-Rubber; Presence of Oxygenated Compounds in — P. Alexander. Gummi-Zeit., 1904, 18, 867—869.

CONTRARY to Weber's statements (Gummi-Zeit., 17, 397 and 952, and 18, 461) the oxygenated constituents of Pontianac rubber, i.e., those soluble in acetone, have the composition $\text{C}_{25}\text{H}_{40}\text{O}$, whilst the portion insoluble in acetone is a hydrocarbon with a composition closely approximating to $\text{C}_{10}\text{H}_{16}$, and in general character resembles the hydrocarbon found in other rubbers. The dinitro method showed that the insoluble portion contains 77 per cent. of rubber substance. Guayrule rubber also appears to consist chiefly of a true hydrocarbon, and the dinitro method indicated slightly above 60 per cent. of caoutchouc. The author considers it doubtful that oxygen compounds exist in rubbers, except in those portions which are soluble in acetone and usually recognised as resin.—R. L. J.

ENGLISH PATENT.

Caoutchouc; Method of Manufacturing Artificial — L. L. A. Seguin and J. F. G. de Roussy de Sales, Paris.
 Eng. Pat. 22,956, Oct. 23, 1903.

SEE Fr. Pat. 336,206 of 1903; this J., 1904, 329.—T. F. B.

FRENCH PATENT.

Calcium Sulphate and Carbonate occurring as Residues in the Manufacture of Caoutchouc Goods, Colours, Ceramic Ware, and Cement Blocks, and in other Chemical Industries; Utilisation of — A. Monin.
 Fr. Pat. 342,797, May 2, 1904. IX., page 937.

XIV.—TANNING; LEATHER, GLUE, SIZE.

ENGLISH PATENT.

Hides and Skins; Treatment of — anterior to and during Tanning. J. Muir, Beith, Scotland. Eng. Pat. 18,677, Aug. 29, 1903.

THE following claims are made: (1) For the use of a fleshing machine, more particularly in connection with fatty skins. The machine consists of a cylinder fitted with spiral knives, and provided with mechanism for regulating the pressure and presenting the hides to the knives. The cylinder is made to revolve at a high rate of speed. (2) For removal of hair from limed skins by drumming them in a cylinder, that is by attrition of one skin on another instead of by hand labour with a stone or knife. (3) In the above drum (a), apertures or slits in its walls to allow of escape of the loosened hair, and (b) a shelf fixed at an angle to the door, so that when the latter is removed the skins fall out automatically. (4) Piling the skins in the pits on a false bottom, so that the whole may be lifted and removed in one operation.—R. L. J.

FRENCH PATENTS.

Vegetable Tannage; Rapid — M. Berthon.
 Fr. Pat. 342,600, April 25, 1904.

To induce rapid absorption of tannin from strong liquors without injury, the limed skins are soaked for 2—4 days in the following liquor at 10°—15° C.: Water, 100 litres; hydrochloric acid, 3 litres; barium chloride, 2 kilos; sea

salt, 18 kilos. When transferred to a new liquor made from natural bark or wood (30 parts per 100 of water) for 6—24 hours at 20—25° C., the salt rapidly passes out, and the plumping agents (acid and barium chloride) resist the otherwise injurious action of the strong tannin. The after-liquors are old ones successively strengthened, resinates of manganese being added to the last. A fortnight in layer pits completes the tannage.—R. L. J.

Leather; Artificial —. H. Karle. Fr. Pat. 342,622, April 25, 1904.

COTTON and similar fibres are formed into a felt, which is impregnated with a mixture of rubber, gutta-percha, and oils, capable of being vulcanised. After rolling into suitable forms or patterns, the whole is vulcanised, and then coloured and finished by various methods.—R. L. J.

Vegetable Tanning or other Substances and Mineral Matters on Hides and Skins; Firing —. F. R. Carmichael. Fr. Pat. 342,762, April 30, 1904.

A SOLUTION of casein (100 parts) in (1) neutral soap (20 parts), (2) glycerin (10 parts), or lactic acid is drummed into the skins, the presence of free alkali being carefully avoided, so that loosely held tannins, extractive matters, or mineral substances are fixed in the hide to give weight and substance. A similar solution is used as a substitute, together with oils, for egg-yolk in stuffing mixtures, e.g., powdered casein, 13 parts; dry soap, 6 parts; wool grease, 4 parts; mineral oil, 9 parts; pale rosin oil, 9 parts; water, 58 parts.—R. L. J.

XVI.—SUGAR, STARCH, GUM, Etc.

Starch Syrups; Examination of —. A. Rössing. XXIII., page 953.

Sugars; Enzymic Inversion of —. N. P. Barendrecht. XVII., page 945.

Molasses; Destruction of Sulphurous Acid in Sulphited —. M. E. Pozzi-Escot. XVII., page 946.

Molasses; Use of Oxidising Agents in the Fermentation of Sulphited —. H. Alliot and G. Gimel. XVII., page 946.

Sugars and Starch; Determination of — in Vegetable Substances. J. S. Ford. XXIII., page 953.

ENGLISH PATENT.

Drying Starch from Rice or other Amylaceous Products. W. F. Bate, Manchester. Eng. Pat. 23,703, Nov. 2, 1903.

RICE starch or other amylaceous products are dried in a vacuum apparatus, comprising an open-ended receptacle mounted in a casing connected with a suction or vacuum pump; the casing carries a false bottom for the said receptacle. There is also a filter bed interposed between the receptacle and the casing, and means are provided for clamping the former to the casing so as to form an air-tight connection.—T. H. P.

UNITED STATES PATENTS.

Condenser for Vacuum-pans [Sugar Manufacture]. J. F. Utrilla, Jersey City, N.J. U.S. Pat. 769,574, Sept. 6, 1904.

THE claim is for the combination of an injector pipe with a condenser cylinder, and a gas-discharge pipe connecting the upper portion of the cylinder with the discharge-pipe of the injector.—L. F. G.

Starch; Process of Making Soluble —. J. David, Assignor to Otto Bredt and Co., Barmen, Germany. U.S. Pat. 769,061, Aug. 30, 1904.

SEE Eng. Pat. 23,370 of 1903; this J., 1904, 29.—T. F. B.

FRENCH PATENTS.

Saccharine Liquors and Molasses; Extraction of — from Plants and Refuse. S. Meisels. Fr. Pat. 342,555, April 22, 1904.

REFUSE vegetable matters, such as sawdust, wood-refuse, straw, maize-stalks, &c., are moistened and heated with a soda-lye of 3—5 per cent. strength for several hours under a pressure of about 10 atmospheres. The boiled mass is largely diluted with water and subjected to a pressure of 20—24 atmospheres, in order to "dissolve the cellulose." The mass is then aerated with sterilised or ozonised air and converted into sugar by means of mucedine.—J. F. B.

Beetroot Chips; Extraction of the Juice from — by Heating and Pressing. A. Wagner and Soc. Selwig and Lange. Fr. Pat. 342,784, May 2, 1904.

THE fresh beetroot chips are heated, without the addition of liquid, to a temperature sufficient to precipitate the albuminoid matters; the heating may be effected either indirectly or directly by means of steam or hot gases; the chips are then pressed in the hot state to extract the juice.—J. F. B.

[Saccharine] Liquids; Elimination of Coloured Impurities from —. E. Koperski. Fr. Pat. 342,229, April 19, 1904.

COLOURED liquids of any kind are decolorised by treatment at the boiling temperature with zinc dust and animal charcoal. In the case of very dark saccharine liquids, it is advantageous to acidify them with an organic acid, such as tartaric acid, before treatment.—J. F. B.

Massecurites; Malaxeur for Crystallising, Concentrating, and Cooling — with Circulation. H. Roy. Fr. Pat. 342,786, May 2, 1904.

THE system of crystallising massecurites by the aid of agitation is operated in a vertical, cylindrical malaxeur, provided with a conical bottom and stirring arms carried by a vertical shaft; the usual heating and cooling coils are also provided. Parallel with the axis of the malaxeur there is an external pipe, which can be put into communication with the interior at various levels. By means of this pipe, the thinner material, which accumulates near the top of the mass, can be decanted off and returned through a special circulating pump at the bottom of the malaxeur. If desirable, the decanted molasses can be re-heated or concentrated in a vacuum pan before it is returned to the malaxeur.—J. F. B.

Desiccating and Cooling Granular Products, such as Crystallised Sugar, &c.; Apparatus for —. F. Hall. Fr. Pat. 342,619, 1904. I., page 929.

XVII.—BREWING, WINES, SPIRITS, Etc.

Hops; The Bitter Constituents of —. C. J. Lintner and J. Schnell. Z. ges. Brauw., 1904, 27, 666—669.

THE authors isolated the α -hop bitter acid in the form of a brown crystalline mass by decomposition of its lead compound by sulphuric acid and extraction with ether. The α -hop bitter acid was decomposed by hydrolysis with alcoholic caustic soda, and yielded, in addition to resinous bodies and valeric acid, about 30 per cent. of a very well crystallised derivative, occurring in the form of colourless, tabular, elongated crystals, melting at 92.5° C. This product does not resinify on exposure; it is sparingly soluble in water, but soluble in most organic solvents. A study of its properties showed it to be a hydroxy-ketonic acid having the formula $C_{15}H_{21}O_4$. Since the α -hop bitter acid yields only valeric acid on oxidation with permanganate, it is regarded as a combination of the above hydroxy-ketonic acid with a valeric acid residue, and its formula should be written $C_{20}H_{27}O_5$, instead of $C_{20}H_{28}O_5$ as found by analysis. The authors propose the following nomenclature for the crystalline bitter constituents of hops:—*Lupulinic acid* for the β -hop bitter acid, $C_{21}H_{29}O_4$; *Humulone* for the α -hop bitter

acid, $C_{20}H_{32}O_5$, since it is probably a lactone; and *Humulinic acid* or *Humulin* for the above hydroxy-ketonic acid decomposition product of humulone.—J. F. B.

Sugars; Enzymic Inversion of — H. P. Barendrecht. Z. physik. Chem., 1904, 49, 456—482.

IN the inversion of cane-sugar by acids the formation of invert-sugar is always proportional to the concentration of cane sugar, but this is not the case with invertase, except at very low initial concentrations (up to about 1 per cent.) of cane-sugar. To account for this, the hypothesis is set up that the catalytic action of invertase is due to a kind of radiation. The inversion of cane-sugar by invertase is retarded to an equal extent by invert-sugar, glucose, and levulose; hence the inversion is not a simple matter of chemical equilibrium, otherwise invert-sugar would show exceptional powers of retardation. Mannose and galactose retard inversion to twice the extent of glucose. Thus, the further hypothesis is suggested that the radiation emitted by invertase is of two different orders: either has the property of inverting cane-sugar, but the one is absorbed only by glucose, the other only by levulose, whilst foreign hexoses absorb either indifferently. Mannitol and dulcitol, which contain one asymmetric carbon atom less than the hexoses, retard somewhat less. Salicin, which contains a glucose differing from that produced from cane-sugar, retards, molecule for molecule, twice as much as glucose. There is no difference between the yeast-enzymes which invert cane-sugar and maltose. Since the maltose molecule is less easily broken down, weakened invertases fail of effect on the maltose though they may be still active towards cane-sugar. Equilibrium between maltose and its primary product of inversion (*i.e.*, bi-rotating glucose) is reached much sooner than in the case of cane-sugar. The inversion is retarded equally by levulose and by galactose.—W. A. C.

Top-Fermentation Yeast; Relations between the Quantity of Pitching Yeast and the Attenuation and Yeast Crop with — J. J. van Hest. Z. ges. Brauw., 1904, 27, 633—636 and 651—654.

WHEN different proportions of yeast are sown in wort of the same concentration, the attenuations at the end of the first day are approximately proportional to the quantity of yeast sown. After that time the proportionality ceases and the attenuations tend towards equalisation; high fermentation temperatures also tend to equalise the attenuations. In the series of experiments here recorded, wort of 10·7° Balling was pitched with proportions ranging between 0·0001 and 20·0 litres of "normal pitching yeast" (see this J., 1904, 30) per hectolitre, and fermented for eight days at 17·5° C. At the end of that time the final attenuation was in all cases identical and perfectly independent of the quantity of pitching yeast. The yeast crop, naturally, was greater the greater the quantity of yeast sown, but after deducting the original quantity of pitching yeast from the quantity of the crop, the absolute value of the yeast increase reached a maximum with a sowing of 1 per cent., and then decreased. The point at which there was no increase at all lay between 10 and 20 per cent. of pitching yeast. The number of times the yeast cells had multiplied (coefficient of reproduction) was inversely proportional to the quantity sown; this coefficient is also a measure of the ratio of young cells to old cells. Similar experiments made at a temperature of 25° C. yielded results of the same nature, but the yeast crops and coefficients of reproduction, especially with the smaller sowings, were generally higher than at the lower temperature. Increase in the concentration of the wort, and aeration during fermentation, the quantity of pitching yeast being constant, also caused an increase in the reproduction coefficients, but not in a degree proportional to the increased nutrition available. Increased reproduction by these methods soon reaches a limit, because the yeast requires a certain degree of dilution of its food and a certain amount of dissolved oxygen in the wort in order to perform its biological functions. The usual limits of practical brewery conditions, as regards proportion of pitching yeast and concentration of wort, correspond approximately to the maximum degree of healthy repro-

duction. With the usual brewery sowing of 0·5 per cent. of "normal" pitching yeast, each cell has at the time of pitching an available free space of 500 times its own volume; at the end of the fermentation at 17·5° C. the yeast had multiplied six times, and each cell then had a free space of 83 times its volume. In the cases where, owing to heavier sowings, the free space at the end of fermentation was less than 83 times, the resultant yeast was generally debilitated to an extent proportional to the restriction of its free space. In top fermentation it is the younger generations of cells which rise to the surface and are used for pitching; it is therefore important that these young cells shall not have suffered from malnutrition and overcrowding during their growth. The cause which prevents the yeast from growing indefinitely, so long as there is excess of nutrition and air, is the accumulation of excreta, *i.e.*, products of metabolism other than alcohol and carbon dioxide, the two latter, in the author's opinion, having very little inhibitive influence. The considerations of the amount of free space available for each yeast cell, as determined by the amount of the original sowing, are also discussed from the point of view of fitness in the struggle for existence and the power of the yeast in suppressing infecting organisms.—J. F. B.

Beers; Comparison between the Composition and Properties of — prepared from Barleys rich and poor in Albumin. R. Wahl. Amer. Brew. Rev., Aug. 1, 1904. Chem.-Zeit., 1904, 28, Rep. 255.

BEERS were prepared in a perfectly parallel manner from Montana barley malt (albuminoid content of barley, 5·23 per cent.) on the one hand, and from Minnesota barley malt (albuminoid content of barley, 15·16 per cent.) on the other. Both beers were stored for a month at 3°—4° C. and then kept in bottle at 0·75° C. for another month. At this temperature both beers became turbid after a few days, but the turbidities subsided, in the Minnesota beer after two weeks, and in the Montana beer after four weeks. The clear beers were tested, both in the pasteurised and unpasteurised condition, for their susceptibility towards chill, with the result that the Montana beer was found to be the more susceptible. The analysis of the nitrogenous constituents of the two beers gave the following results:—

	Montana Beer.	Minnesota Beer.
	Per Cent.	Per Cent.
Original wort solids	13·98	13·98
Albumin	0·018	0·027
Albumose	0·109	0·137
Peptone	0·201	0·302
Amides	0·36	0·504
Total albuminoids	0·68	0·97
Albumin deposited during cold storage	0·0024	0·0024

Thus the higher proportion of albuminoid constituents in the Minnesota beer had no evil effects in rendering the beer susceptible to chill, but, on the other hand, it had a favourable influence in increasing the palate fullness and the permanence of the "head." The author gives the preference to barleys rich in albumin for brewing purposes, so far as American barleys are concerned.—J. F. B.

Beer and Brewing; Surface Influences in — F. Emslander and H. Freundlich. Z. physik. Chem., 1904, 49, 317—328.

THE authors discuss the various physical phenomena which are met with in the brewery as the results of surface influences of various kinds. Owing to the fact that beer consists partially of a pseudo-solution ("sol") of organic colloids, the particles of which possess surfaces of separation from the liquid in which they are suspended, phenomena of the nature of "adsorption," *i.e.*, concentration and retention of certain of the dissolved matters on the outer surfaces of the colloid particles, are produced. Electrical experiments similar to those described by Biltz for other colloid "sols" (see this J., 1904, 459 and 619) proved that the organic colloids of beer are positive relatively to the liquid by which they are surrounded. The beer colloids migrate to

the cathode under these conditions in the form of a thick, flocculent mass which carries with it most of the colouring matter. The foam surrounding the cathode is yellow, very glutinous and permanent, whereas, that near the anode is pure white and transient. Owing to the surface influence of "adsorption" these colloidal bodies attract to themselves the colouring matter, the flavouring and odorous bodies, and the carbon dioxide. To them the qualities known as "permanence of head," "fulness of body" and "condition" of the beer are, therefore, attributable. Geffcken has recorded (this J., 1904, 914) how, in the case of ferric hydroxide "sol," also a positive colloid, there is an analogous instance of the retention of carbon dioxide by "adsorption." Cases of "adsorption" occur in all the filtration operations in the brewery, for instance, in running off the wort from the mash the soluble extractive matters are retained with exceptional firmness by the insoluble colloids of the grains. Passing on to other influences exerted by surfaces upon the brewing operations, the authors discuss the different powers of different surfaces in discharging a state of super-saturation of the carbon dioxide during fermentation. Since a rough or greasy surface discharges the gas with greater facility than a clean smooth surface, and since a rapid removal of the carbon dioxide favours the rapidity of fermentation, the following values for the apparent attenuations reached by the same wort fermented in vessels of different internal structure for nine days at 7°–8° C. are explained:—Wood, dry, untreated, 72·8; paraffined wood, 71·8; wood boiled and saturated with wort, 69·9; wood with pitch coating, 68·4; wood, lacquered, 57·4; glass, 52·9 per cent. The rapidity of clarification also followed the same order.—J. F. B.

Brewery Refuse; Purification of — H. M. Wilson. *Brewers' J.*, 1904, 40, 635–637.

OWING to the fact that brewery refuse rapidly undergoes acid fermentation, it is very refractory towards the action of the ordinary purifying organisms, and consequently the septic tank treatment is not one to be recommended for this purpose. The most satisfactory results were obtained by successively treating the refuse by chemical precipitation, filtration or percolation, and straining through sand. The refuse was first rendered alkaline by the addition of milk of lime, about 45 grains of lime per gallon of liquid being generally found sufficient. After allowing the mixture to settle, the liquid portion was then subjected to double contact filtration, the filters being constructed as follows:—The first was underdrained by channels formed of loose bricks laid on the concrete bottom of the bed. The latter was then made up of 6 ins. of clinker sized from 1 in. to 1½ in., then 12 ins. from ¾ in. to 1 in., 12 ins. from ½ in. to ¾ in., and the top 9 ins. from ¼ in. to ½ in., 3 ft. 3 ins. in all. The second bed, underdrained in the same way, consisted of 12 ins. of sifted ashes of 1 in. size, 12 ins. of ¾ in., 9 ins. from ½ to ¾ in., 3 ins. of fine lime-stone chippings, and again 3 ins. of fine ashes free from dust; 3 ft. 3 ins. in all. The first bed was also covered at the inlet end with an extra layer of fine ashes 3 ins. in depth, to catch the fine suspended matter carried forward from the settling tank by the flushes of liquid. The effluent from these filters, not being sufficiently clean to run into a river, was then pumped up into a tank, and passed by means of a rotating sprinkler on to a coke filter, consisting of a bed, 6 ft. in diameter and 6 ft. deep, of coke breeze, about a quarter of which had been obtained from some first contact beds at sewage works, and the remainder direct from the gas works. The pieces were about the size of apples, and a layer of stones was placed at the bottom of the bed for drainage purposes. By supplying the effluent to this filter in intermittent doses every 5 minutes for 8 hours a day to the amount of 140 gallons per sq. yard per day, the resulting effluent was quite satisfactory and contained nitrates. A final straining through sand was found to be necessary as usual. The albuminoid ammonia was reduced to 0·15 part per 100,000, and the oxygen absorbed to 1·8 parts. An earth-filter was tried instead of the coke-bed, and yielded nearly the same results. The above experiments were to some extent determined by the nature of the existing works at the brewery, but in constructing new works, the best course would be to provide

tanks for chemical treatment, a first percolation filter and another at a lower level, and finally a shallow sand strainer. To prevent acid fermentation of their contents, the tanks should not be too large, and the filters should be of sufficient area to allow of only a moderate quantity per yard being passed through them. The actual amount of purification effected during the experiments amounted to 96 per cent. as regards the albuminoid ammonia, and 93 per cent. reckoned on the oxygen absorbed.—W. P. S.

Molasses; Use of Oxidising Agents in the Fermentation of Sulphited — H. Alliot and G. Gimel. *Bull. Assoc. Chim. Sacr. et Dist.*, 1904, 22, 88–92.

THE method of Saillard for removing sulphurous acid, by boiling with sulphuric acid, is too costly owing to the large consumption of fuel. The authors find that calcium hypochlorite and manganese dioxide are among the chemical oxidising agents presenting most interest. Calcium hypochlorite, from its cheapness and more rapid action, is to be preferred, and its employment is more general, since there is no need for it to act in an acid medium as is the case with manganese dioxide. Moreover, the salts of manganese, although not injurious, retard fermentation. The advantages secured are the disappearance of sulphurous acid, either free or as potassium bisulphite, bactericidal action and consequent purity of fermentation, and an acceleration in the multiplication of yeast cells. The quantity of hypochlorite used is 50 grms. per hectolitre.—L. J. de W.

Molasses; Destruction of Sulphurous Acid in Sulphited — M. E. Pozzi-Escot. *Bull. Assoc. Chim. Sacr. et Dist.*, 1904, 22, 92–101.

ALTHOUGH the use of sulphurous acid as an antiseptic is valuable in obtaining pure fermentations, large quantities give rise to the production of sulphuretted hydrogen by enzymic hydrogenation, with formation of metallic sulphides in the pipes, and the sulphurous acid also acts injuriously by retarding the development of the yeast. It has no sensible action on the activity of sucrase and zymase of yeast. In active fermentation with acclimatised yeast, part of the sulphurous acid is reduced, part oxidised, and part absorbed. It is not possible to destroy the acid by chemical reduction in distillery wort, and electrolytic reduction introduces substances injurious to yeast. By using a scrubber and working at 60°–70° C. it is possible to oxidise sulphurous acid practically with atmospheric air. This action may be assisted by manganese protoxide, which was found to have only a negligible influence when present to the extent of 0·5 grm. per litre. Worts fermented in presence of a large quantity of sulphurous acid contain notable quantities of fatty acid, aldehyde, and higher alcohols. Calcium hypochlorite is useful if added in quantity to merely reduce the quantity of sulphurous acid, but electrolytic oxidation introduces a large quantity of accessory products in presence of which yeast develops with difficulty.—L. J. de W.

Sugars and Starch; Determination of — in *Vegetable Substances [Malt]*. J. S. Ford. XXIII., page 953.

ENGLISH PATENTS.

Malting Apparatus. R. Plischke and A. Beschorner, Vienna. Eng. Pat. 28,264, Dec. 23, 1903.

SEE Fr. Pat. 337,983 of 1903; this J., 1904, 556.—T. F. B.

Whey into Vinegar; Method of Converting — A. Barbier, Paris. Eng. Pat. 16,189, July 21, 1904.

SEE Fr. Pat. 334,071 of 1903; this J., 1904, 32.—T. F. B.

Distillery or other Impure Effluents containing Matter in Suspension; Bacterial Bed System of Treating — A. M. Cowie. Eng. Pat. 20,025, Sept. 17, 1903. XVIII. B., page 947.

FRENCH PATENT.

Albumin-Tannate; Soluble — [for Filtering and Clarifying Wine, &c.]. Soc. Lasmolles and R. de la Faye. Fr. Pat. 342,682, April 27, 1904.

POWDERED casein (46 parts), tannin (46 parts), and sodium bicarbonate (8 parts), are mixed together. This

Powder forms a clear solution in tepid water, and when added to acid liquors such as wine, the insoluble albuminate precipitates out, carrying with it suspended matter. Infusorial earth may be used in conjunction. Filter cloths soaked in the solution are said to become much improved for the filtration of weakly acid, turbid liquors.—R. L. J.

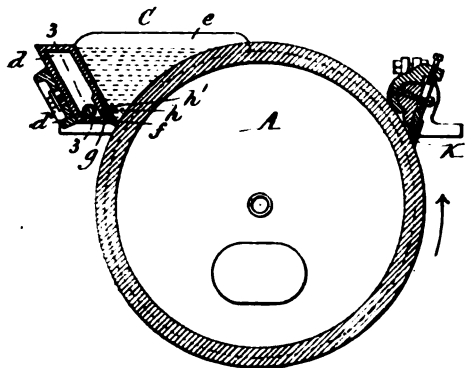
XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(A.)—FOODS.

UNITED STATES PATENTS.

Evaporating Liquids [Milk]; Process for —. J. A. Just, Pulaski, N.Y. U.S. Pat. 765,343, July 19, 1904.

THE liquid in the form of a film is evaporated by exposing it to the action of a heated surface on one side, and to a cooled surface on the opposite side. This method prevents the overheating of the material, and keeps the outer surface



of the film in a porous condition, so that evaporation easily takes place. A is a hollow cylinder, heated by passing steam into the interior, and capable of being rotated in the direction of the arrow by suitable means. A flat water-cooled box (3) is placed at an angle against the cylinder, and so adjusted that only a thin film of liquid can escape as the cylinder rotates. The liquid to be evaporated is supplied at C, and the dried product is taken off by the scraper K. The use of the cooled surface allows a sufficiently high temperature to be applied to ensure the sterilisation as well as the complete desiccation of the material without damage from overheating.—W. H. C.

FRENCH PATENT.

Foods; Process of Sterilising —. K. C. L. G. Budde. Fr. Pat. 342,769, April 30, 1904.

THE food—green peas, for instance—is heated for 10 minutes with a 0.005 per cent. solution of formaldehyde, and afterwards for 10 minutes with a 0.025 per cent. solution of hydrogen peroxide, and then canned. Other foods, such as fish, milk, or meat, may be similarly sterilised, but without heating, if the treatment be more prolonged. The hydrogen peroxide may be replaced by sodium peroxide or persulphate.—W. P. S.

(B.)—SANITATION; WATER PURIFICATION.

Brewery Refuse; Purification of —. H. M. Wilson. XVII., page 246.

ENGLISH PATENTS.

Sewage and other Fluids; Purification of —. A. A. Adams, London, and E. Springborn, Glasgow. Eng. Pat. 19,599, Sept. 11, 1903.

THE sewage is conducted into a settling tank containing a horizontal grating covered with filtering material (coke). After passing this grating the liquid flows from the lower

part of the tank into a distributing main, and from the latter to a number of filter channels. These are fitted with box screens and a series of filters. The filters, consisting of any suitable filtering material, packed between perforated walls, are in pairs, so that while one is lowered into the channel, the other is suspended in the air. By this means the filters are alternately aerated. The channels discharge into a main effluent conduit. A space of 2 feet is left between the successive pairs of filters, a bed of gravel confined by low walls extending across the channel, being placed in this space. The second wall of each gravel bed is perforated by tubes sloping upwards.—W. P. S.

Distillery or other Impure Effluents containing Matter in Suspension; Bacterial Bed System of Treating —. A. M. Cowie, Dufftown, Scotland. Eng. Pat. 20,025, Sept. 17, 1903.

TO the usual bacterial installations are added sludging compartments provided with sludging boards for the purpose of removing suspended matter, especially yeast. The compartments are preferably made deep and narrow.—A. G. L.

Sewage and other Fluids; Apparatus for Treating —. W. J. Schweitzer, White Plains, N.Y., U.S.A. Eng. Pat. 14,003, June 21, 1904.

SEE U.S. Pat. 763,026 of 1904; this J., 1904, 758.—T. F. B.

Ammonia; Process for the Extraction of — from the Sewage Waters of Towns, and similar Liquids. R. Schilling and C. Kremer, Berlin. Eng. Pat. 14,966, July 14, 1904.

THE clarified sewage-waters are led on to layers of coke, slag, or the like contained in closed receptacles, and after remaining some time are removed, and hot gases passed through the layers of coke, &c. After these are well heated, the entrance of gases is stopped, and the filters are again filled for renewal of the process. The gases are led away to be treated for recovery of the ammonia. The hot gases used are, preferably, produced by the combustion of the slime deposited during the preliminary purification.—E. S.

(C.)—DISINFECTANTS.

ENGLISH PATENT.

Insecticide. G. Muller, Mulhausen, Germany. Eng. Pat. 18,678, Aug. 29, 1903.

"SACCHARIC acid" is claimed as an insecticide. Owing to its hygroscopic nature, it is to be mixed with some "animal or mineral powder" (e.g. talc), and in the state of powder is blown into the air by distributing bellows.—T. F. B.

XIX.—PAPER, PASTEBOARD, Etc.

Sulphite Wood Pulp; Notes on the Boiling of —. Montaus. Wochenbl. f. Papierfab., 1904, 35, 2332—2333.

THE improvements introduced in recent years in the manufacture of sulphite wood pulp have led to a considerable shortening of the boiling process, so that in the Mitscherlich apparatus the boiling is reduced to 28—30 hours, and in the Ritter-Kellner to 14—16 hours. The time of boiling is regulated by the nature of the wood, strength of liquor, &c.; it also depends on the kind of pulp it is desired to make. If easy bleaching be not a desideratum, and if a strong, tough cellulose be required, the process of "high" boiling is adopted, i.e., the boiling is stopped whilst the liquor still contains a relatively high percentage of sulphur dioxide. But if an easy bleaching pulp be required, it is boiled "low" until little or no sulphur dioxide remains. Pulp boiled "low" is, however, proportionately weaker; it leaves the boiler with a pale to chocolate-brown colour. The browner the stuff as it leaves the boiler, the less the quantity of chlorine required for bleaching. Sometimes a "high"-boiled pulp will turn brown when not desired to do so, especially if the blowing-off of the gases be delayed. If, as a compromise, a pale, strong pulp, which does not present too great difficulties in bleaching, be desired, the

temperature in the boiler should not be allowed to rise too rapidly, but the whole boiling should be conducted more slowly than for pulp which has not to be bleached. The "brown-boiled" pulp, above referred to, must not be confounded with the inferior scorched pulp obtained when the wood is not fully covered with liquor. For the preparation of a fine "white-boiled" pulp, it is recommended to use perfectly fresh pine wood, in which all the sap is still present, and to boil it slowly with a strong sulphite solution. If properly prepared the resulting pulp will be nearly as white as if it had been bleached.—J. F. B.

Sulphite Cellulose; Bleaching of — Montanus.
Wochenbl. f. Papierfab., 1904, 35, 2761—2762.

IN the author's experience the consumption of bleach, in bleaching sulphite wood-pulp to a "high white," works out at an average of 14 per cent. The author never uses acid, and does not heat the pulp to a higher temperature than 35°–40° C. If the stuff, for any reason, has to be kept for a long time in the bleaching engine, it is best to mix it cold. Thorough washing after bleaching causes a certain fall back in colour; the use of an antichlor also dulls the white slightly. In the case of a pulp which bleaches with difficulty, the author does not add an unnecessarily large quantity of bleach, but discharges the engine whilst the stuff is still yellowish and contains a residue of chlorine. After a few days the same stuff is loaded back into the engine with quite a small addition of bleach, which then brings about a far better white than if the whole quantity of bleach had been employed in a single operation; but if the cellulose is well boiled and not browned, this double bleaching is never necessary. The bleach solution is made up to a density of 3.5° or 4° B., but the active chlorine should always be determined chemically. The composition of the water has a great influence upon the bleaching process. The consumption of chlorine is relatively less in hollanders which take a heavy charge than in the smaller ones.—J. F. B.

Sulphite Cellulose; Manufacture of Tissue Paper from — C. Meyer. Papier-Zeit., 1904, 29, 2685—2686.

FOR the manufacture of tissue paper from wood cellulose, a machine of the Fourdrinier type with several drying cylinders is the most satisfactory. Sulphite pulp is preferable to soda pulp, on account of its superior strength. The chief difficulties encountered are occasioned by the presence of resinous impurities in the raw material, which cause sticking and tearing. The whole secret of successful manufacture lies in a suitable boiling and bleaching of the pulp. The boiling liquor should be as rich as possible in sulphurous acid, and the duration of boiling must not be curtailed. The condition of the wood is also important; it must not be too fresh, and wood which has been floated down the rivers always gives the best results. The residual sticky impurities are removed by bleaching. This operation is not as a rule an easy one, since the resinous bodies in combination with gypsum form a hard scale on the fibres. Bleaching should be conducted at a lukewarm temperature with 18–20 per cent. of bleach, without the assistance of acid. A preliminary treatment with sodium carbonate is not necessary with a well-boiled pulp; the use of antichlor is desirable. With a suitable machine, a speed of 35 metres per minute is attainable, working on tissues at 17 grms. per square metre. The wire should not be coarser than 85–90 mesh (German measure), otherwise very inferior results are obtained. If the shaker does not work with perfect uniformity and horizontally, it will destroy the wire and had better be discarded; the dandy roll may also be omitted with advantage. The stuff should be sized very sparingly, but plenty of alum should be used. With steel knives in ordinary beaters it is usual to allow two hours for opening out the fibres, four hours for beating proper, with gradually increasing pressure, and two hours for brushing out and for making the stuff even. Beating must on no account be hurried, but the time can be shortened considerably by using broad bronze or basalt-stone beating surfaces, which rapidly impart the desirable "wetness" to the pulp without beating it "dead."—J. F. B.

Bank-Note Papers. Liber. Wochenbl. f. Papierfab.,
1904, 35, 2757—2761.

DETAILS are given of comparative tests made with three papers made from pulps of the following composition: (a) 30 per cent. of flax and 70 per cent. of hemp, both in the partially crude, semi-white state; (b) 85 per cent. of pulp (a) with 15 per cent. of raw unbleached cotton; (c) pure ramie pulp. The pulps were beaten for a very long time, especially pulp (a), and the consequent "wetness" made the treatment on the hand-mould very difficult. The strength tests of the unized papers showed that the paper (a) was the strongest, with an average breaking length of 8310 metres; the presence of the cotton in the paper from pulp (b) caused the lowering of the breaking length to 7096 m., a fall of 14.7 per cent.; the strength of the ramie paper was only 6112 m. The effect of animal sizing on the three papers was different; the strength of (a) was increased 43 per cent., that of (b) 30 per cent., and that of (c) only 18 per cent. The rosin sizing of the same pulps in the beater caused decreases of strength amounting to 6 per cent. in (a), 12.5 per cent. in (b), and 3 per cent. in (c). The ramie fibre responds less to the influence of the sizing, whether animal or rosin, than the other fibres, owing to its cruder nature. The presence of incrustations on the surface of the ramie fibres accounts for the unabsorbent nature of the paper, and also causes the marked deficiency of felting properties, as shown by the comparative weakness of the waterleaf paper, although the individual ramie fibre is stronger than either flax or hemp. In the case of pulp (b) the unbleached cotton is also less absorbent than the flax and hemp, and the paper is less strengthened by the animal size than paper (a). When the rosin-sized papers were subsequently sized with gelatin the paper containing the cotton increased 25 per cent. in strength, whereas the ramie paper increased only slightly. The author concludes that ramie is unsuitable for the manufacture of strong papers, and its great transparency is not favourable to the water-marking. Phormium (New Zealand flax) is a fibre which felts very well, and should prove an excellent constituent for water-marked bank papers; certain of the Russian notes contain a layer of phormium mixed with hemp. Since the strength requisite for bank notes can only be obtained by using semi-crude fibres beaten very "wet," the resultant transparency causes difficulties in fine engraving. In the author's opinion the desirable strength, combined with opacity, would be afforded by the use of the Japanese paper-mulberry fibre if it were obtainable in a regular supply. A very good substitute for this can, however, be got from several European species of mulberry trees of the genus *Morus*. The author has prepared pulps from these, and finds that they bleach well and give very strong papers, with an exceptionally high resistance to crumpling.—J. F. B.

Paper Machine; Cleaning the Wire of the — J. K.
Wochenbl. f. Papierfab., 1904, 35, 2837—2838.

THE writer recommends the use of a steam jet for keeping the wire cloth of the paper machine free from impurities. A spraying pipe, connected with a $\frac{3}{4}$ -in. steam pipe, is placed on the under side of the wire cloth, about 4 ins. in front of or behind the tension roll or near one of the other guide rolls. The spray should not be more than 2 ins. away from the surface of the wire. This spray can be applied at any convenient time, but preferably immediately after the machine stops work, the wire being run round several times for the purpose; a regular spraying every other day should suffice to keep the wire in good condition.—J. F. B.

ENGLISH PATENTS.

Paper and like Material; Machine for Coating —
L. W. Noyes, Mechanicsville, N.Y., and J. W. Krueger,
New York, U.S.A. Eng. Pat. 11,253, May 16, 1904.

IN order to increase the speed with which a web of paper may be passed through the coating machine, the web, as it emerges from the coating devices, is engaged by a suction box, from which it is transferred to a double or compound apron composed of a short endless apron of continuous

material, and a long endless apron of perforated material. Both aprons travel in the same plane, and the brushes operate upon the paper, whilst the latter is supported by both aprons; after the short apron has returned, however, the web still passes on the long apron over a final suction box, immediately above which is another brush; the long apron then returns, and the paper passes on to the driers.

—J. F. B.

Pulp Strainers for Paper Manufacture. P. Nebrich, Prag-Schmiedow, Germany. Eng. Pat. 16,403, July 14, 1904.

A COMPARTMENT is formed by two vertical slotted strainer plates situated in a vat; the top of this compartment is closed by a movable cover, and a valved opening at the bottom communicates with a waste-channel. The crude pulp is introduced into the compartment between the two strainer-plates, and is there subjected to the oscillating movement of a centrally pivoted plate swinging on a horizontal axis. The oscillating motion at each stroke forces the fibres through two diagonally opposite half-sections of the strainer-plates, at the same time creating a suction on the complementary half-sections, which washes the slots free from knots. The latter collect at the bottom, and are removed from time to time through the waste valve.

—J. F. B.

UNITED STATES PATENT.

Binding Mediums for Colours [for Paper, &c.]; Production of —. C. H. Voigt, Assignor to L. Voigt, Leipzig-Plagwitz, Germany. U.S. Pat. 770,202, Sept. 13, 1904.

As a substitute for animal glue to be used with colouring material for pasteboard, &c., 100 parts of starch, 4–6 parts of a mixture of an "alkaline sulphate and a superoxide compound," and 300–500 parts of water, are heated together under pressure at 100°–200° C.—M. J. S.

FRENCH PATENTS.

Printing Papers; Manufacture of —. J. von Schmaedel. Fr. Pat. 342,206, April 11, 1904.

A SOLUTION of a suitable glucoside, such as esculin, saponin, &c., is added to the paper either by impregnation of the finished or partially finished paper, or by incorporation with the pulp. The saponin renders the paper very pliable, and enables it to take a surface which is eminently fitted for receiving the colours and inks in printing.—J. F. B.

Paper Pulp; Filter for —. F. G. Busbridge. Fr. Pat. 342,265, April 13, 1904. Under Internat. Conv., Nov. 17, 1903.

SEE Eng. Pat. 25,073 of 1903; this J., 1904, 677.—T. F. B.

Celluloid Composition; New —. R. Ortmann. Fr. Pat. 342,464, April 19, 1904.

ORDINARY pyroxylin, 1 kilo., is mixed with 0.065 litre of turpentine, 0.25 litre of a ketone, and 0.25 litre of ether; 0.5–0.75 litre of methyl alcohol is then added, and the mixture is allowed to remain for 12 hours before being milled between hot rolls. Venice turpentine and acetone yield the best results, but any turpentines or derived resins and any ketones may be used.—J. F. B.

Collodion and Cellulose Solutions; Apparatus for Filtering and Spinning Filaments from —. Soc. Desmarais et Morane and M. Denis. Fr. Pat. 342,655, April 26, 1904. V., page 933.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Cinchonine Iso-Bases. Z. H. Skraup and R. Zwerger. Monatsh. Chem., 1904, 25, 894–906.

FURTHER experiments have been made with a view to confirming the authors' opinion that the relations between cinchonine and the so-called iso-bases, i.e., α -i- and β -i-cinchonine, and allocinchonine may be most clearly shown by

formulas differing not so much structurally as stereochemically. The work comprised experiments on: the action of hydrochloric acid on α -i-cinchonine both at the ordinary and at higher pressures; decomposition of hydrochloro- α -i-cinchonine by alcoholic potash; heating trihydrochloro-cinchonine with hydrochloric acid in a sealed tube; action of hydrochloric acid on β -i-cinchonine; allocinchonine and hydrochloric acid; α -i-cinchonine and hydrobromic acid; action of chlorine on the cinchonine bases.—A. S.

Clove Oil; Refractive Index of —. W. H. Simmons. Chem. News, 1904, 90, 146.

THE author points out the usefulness of the determination of the refractive index to distillers of clove oil. With pure oils the refractive index is approximately proportional to the percentage of eugenol. In the case of adulterated oils, however, the refractive index cannot be regarded as a measure of the amount of eugenol, as is shown by the figures for No. 9 in the following table:—

Sample.	Specific Gravity at 15°, 15° C.	Rotation. $[\alpha]_D$	Refractive Index. n_D^{20}	Phenols.
No. 1	1.0606	—	1.5382	Per Cent.
" 2	1.0709	— 0° 41'	1.5318	93.0
" 3	1.0508	— 0° 53'	1.5304	88.0
" 4	1.0475	— 1° 0'	1.5304	86.0
" 5	1.0465	— 0° 23'	1.5297	85.5
" 6	1.0580	— 0° 35'	1.5340	92.0
" 7	1.0549	— 0° 40'	1.5340	91.5
" 8	1.0507	— 0° 51'	1.5338	97.0
" 9	1.0617	— 0° 20'	1.5327	82.0

—A. S.

Acorus Calamus; Constituents of the Essential Oil of —. H. Thoms and R. Beckstroem. Ber. Pharm. 38, 187. Pharm. J., 1904, 73, 428.

THE following constituents have been recognised in the essential oil of sweet flag (*Acorus calamus*):—Free normal heptylic and palmitic acids, eugenol, asaryl aldehyde, esters of acetic and palmitic acids, the crystalline body, $C_{15}H_{26}O_2$, m. pt. 168° C., previously detected by Schimmel and by Soden and Rojahn, which the authors name *calameone*, and asarone, $C_{12}H_{16}O_2$. Asarone forms a solid compound with phosphoric or arsenic acid, in the same manner as cineol [eucalyptol]. During the reaction it becomes polymerised, forming *parasarone*, $(C_{12}H_{16}O_2)_3$, a product which becomes transparent and vitreous at 173° C., and melts at 208° C., and is readily soluble in most organic solvents.—A. S.

Cascara Bark; Chemical Examination of —. H. A. D. Jowett. Amer. Pharm. Assoc., 1904. Chem. and Druggist, 1904, 65, 509.

THE author finds that cascara sagrada contains emodin, glucose, and small amounts of (1) a substance apparently an isomeride of emodin, and possibly identical with the isomodulin obtained from *Rhamnus frangula* bark; and (2) a substance which yields syringic acid when treated with acids. No evidence could be obtained of the existence of chrysophanic acid or chrysarobin, or of glucosides yielding, on hydrolysis, emodin, chrysophanic acid, or rhamnetin (compare this J., 1893, 513; 1898, 792; 1901, 66). Emodin, though insoluble in water, is soluble in the aqueous extract of cascara bark, and can be extracted only slowly and with difficulty by shaking with immiscible solvents. This behaviour probably accounts for the statements that cascara bark does not contain emodin. If the aqueous extract be treated with acids, the substances soluble in water are decomposed with formation of resins, and the emodin can then be readily extracted. Cascara sagrada also contains a hydrolytic enzyme capable of decomposing amygdalin, and about two per cent. of a fat consisting of arachidic acid, both free and combined with an alcohol, and substances, probably glycerides, yielding linolic and myristic acids on hydrolysis. The alcohol with which the arachidic acid is combined, has been named *rhammol*. It has the composition $C_{20}H_{34}O$, melts at 135°–136° C., and is identical with the alcohol obtained from *Ko-sam* seeds by Power and Lees

(this J., 1903, 1013). Physiological experiments showed that emodin is not the active constituent of cascara sagrada. The active principle or principles were not isolated, but are contained in that portion of the extract which is precipitated by lead subacetate. It is also soluble in water and in alcohol.—A. S.

Phenol; Volumetric Determination of —. F. X. Moerk. XXIII., page 958.

Aldehydes [in Essential Oils]; Detection of —, and the *Constitution of Nitrosodimethylaniline*. G. Velardi. XXIII., page 952.

Rhubarb; Colorimetric Valuation of —. A. Tschirch. XXIII., page 953.

UNITED STATES PATENTS.

Metatolylsemicarbazide. J. Callsen, Elberfeld, Germany, Assignor to Farbenfabr. of Elberfeld Co., New York. U.S. Pat. 765,164, July 19, 1904.

By treating *m*-tolylhydrazine with cyanic acid or its salts, metatolylsemicarbazide is obtained in the form of colourless crystals of m. pt. 183°—184° C., sparingly soluble in cold water, soluble in hot water and alcohol, and insoluble in ether. It is said to possess therapeutic (antipyretic) properties.—T. F. B.

Polychloral, and Process of Making same. S. Gärtner Halle-on-the-Saale, Germany. U.S. Pat. 768,744, Aug., 30, 1904.

CHLORAL is polymerised by gradually adding an amine (e.g., pyridine) to cooled chloral, with constant stirring, until the mass solidifies, when it is shaken with dilute hydrochloric acid, and the residue washed and dried. Polychloral, as thus obtained, is a slightly volatile anæsthetic substance, capable of volatilisation without melting, converted by hot water or hot alcohol into chloral hydrate or chloral alcoholate, and decomposed by alkalis into chloroform and formic acid.—T. F. B.

Iron and Arsenic; Soluble Compound of —, and *Process of Making same*. L. Spiegel, Charlottenburg, Germany. U.S. Pat. 768,886, Aug. 30, 1904.

SEE Fr. Pat. 336,127 of 1903; this J., 1904, 383.—T. F. B.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

ENGLISH PATENT.

Sensitising Dyestuffs [for Photographic Purposes]; Manufacture of New —, and *Intermediate Products for Use therein*. H. E. Newton, London. From Farbenfabr. vorm. F. Bayer and Co., Elberfeld, Germany. Eng. Pat. 25,144, Nov. 18, 1903.

SEE U.S. Pat. 752,323 of 1904 and Fr. Pat. 337,704 of 1903; this J., 1904, 337 and 486 respectively.—T. F. B.

UNITED STATES PATENT.

Colour Photography. W. C. South, Berwyn, Pa. U.S. Pat. 769,773, Sept. 13, 1904.

SEE Eng. Pat. 123 of 1903; this J., 1903, 380.—T. F. B.

FRENCH PATENT.

Photographs on Linen or other Fabrics or Substances; Production of —. O. Fulton and W. M. Gillard. Fr. Pat. 342,328, April 5, 1904. Under Internat. Conv., May 16, 1903.

SEE Eng. Pat. 11,319 of 1903; this J., 1904, 622.—T. F. B.

XXII.—EXPLOSIVES, MATCHES, Etc.

Nitrocellulose; Determination of the Stability of —. E. Bergmann and A. Junk. XXIII., page 953.

Double Acetylides. A. E. Edwards and W. R. Hodgkinson. XXIV., page 954.

ENGLISH PATENTS.

Compositions for Fuses, Self-Propelling Explosive Projectiles, or the like; Slow-Combustion —. W. T. Unge, Stockholm. Eng. Pat. 23,766, Nov. 2, 1903.

SEE Fr. Pat. 336,266 of 1903; this J., 1904, 385.—T. F. B.

Explosives. H. J. Haddan, London. From J. Führer, Vienna. Eng. Pat. 3253, Feb. 9, 1904.

THE disruptive power of explosives consisting of ammonium nitrate and aluminium powder is found to be considerably increased by the addition of the higher nitro-derivatives of benzene, phenols, and naphthalene, and especially toluene. An example of such an explosive mixture is ammonium nitrate, 65 parts; carbon, 2 parts; dinitrotoluene, 10 parts; aluminium, 23 parts. The addition of carbon is also claimed as rendering the mixture less hygroscopic.—T. F. B.

[*Explosive*] *Nitrated Carbohydrates*. A. Hough, Dover, N.J., U.S.A. Eng. Pat. 12,627, June 8, 1904. Under Internat. Conv., June 13, 1903.

SEE U.S. Pat. 751,076 of 1904; this J., 1904, 385.—T. F. B.

UNITED STATES PATENTS.

Explosive. H. von Dahmen, Assignor to Firma G. Both, Vienna. U.S. Pats. 770,046 and 770,047, Sept. 13, 1904.

SEE Eng. Pat. 3253 and Fr. Pat. 341,633 of 1904; see above, and this J., 1904, 882.—T. F. B.

Lubricant for Oiling Guns; Alkaline —. J. G. Wild, Assignor to Winchester Repeating Arms Co. U.S. Pat. 768,835, Aug. 30, 1904. Ill., page 931.

FRENCH PATENT.

[*Nitrocellulose*] *Method for Nitrating* —. J. Selwig. Fr. Pat. 342,502, April 21, 1904.

WHILE cellulose is being nitrated in a centrifugal nitrating apparatus it is proposed to make the acid circulate continuously through the material by means of a pump, for the purpose of producing a more uniform nitration and avoiding local centres of heating.—G. W. McD.

XXIII.—ANALYTICAL CHEMISTRY.

APPARATUS, ETC.

UNITED STATES PATENT.

Pouring and Filtering; Apparatus for —. E. Keller and A. Ferrell, Baltimore, Md. U.S. Pat. 768,603, Aug. 30, 1904.

THE funnels are held in an adjustable rack above the row of beakers in which the filtrate is to be received. The beakers holding the liquids to be filtered are mounted in another rack, in which they are held by clamps, which also hold pouring rods against the lips of the beakers. By suitable mechanism, the beakers can be tilted to the desired extent and a continuous stream of liquid poured into the funnels. Means are provided for adjusting beakers of different sizes in the rack so that their lips are all in the same line.—W. H. C.

INORGANIC—QUALITATIVE.

Phosphide, Arsenide, and Antimonide of Hydrogen; Reagent for —. P. Lemoult. Comptes rend., 1904, 139, 478—480.

MERCUIC iodide dissolved in excess of potassium iodide solution, but not rendered alkaline as in preparing Nessler's reagent, forms a very sensitive reagent for the detection of phosphine, arsine, and stibine, with each of which it forms a crystalline precipitate, orange-yellow, light brown, and dark brown respectively, of formula RHg_2I_3 . The precipitates are readily decomposed by alkalis or by strong nitric acid or *aqua regia*.—J. T. D.

Precious Metals; Coloration of the Borax Bead by Colloidal Dissolved — [Detection of]. J. Donau. *Monatsh. Chem.*, 1904, 25, 913—918.

THE author finds that the colorations imparted to a fused borax bead by the precious metals afford an extremely sensitive test for their detection. The colour produced is, in general, the same as that of a colloidal solution of the metal. In the case of gold, the bead is first coloured red or purple; on heating for a longer time, the colour changes first to blue, then to greenish-blue, and finally disappears. The smallest weight of gold which can be detected is 0.025 μ grm. (0.000025 mgrm.). Alkali salts, silicic acid, and iron have practically no influence on the test; platinum, if the amount present be greater than 6 per cent. of that of the gold, obscures the reaction. The coloration is not produced if the gold solution contains free sulphuric acid or free halogens. Silver colours the borax bead yellow, the coloration appearing after 1—2 mins., but disappearing again on continued heating; the smallest amount which can be detected is 0.18 μ grm. In the case of platinum the borax bead appears fawn-coloured by transmitted light, and "milky" by reflected light. The smallest quantity which can be detected is 0.05 μ grm. The coloration disappears on continued heating of the borax bead, but it persists longer than in the case of gold. Iridium and osmium colour the bead in the same manner as platinum, but no turbidity is to be observed by reflected light. With rhodium the borax bead appears brown by transmitted light and a slate-gray by reflected light. Palladium and ruthenium colour the bead black. Figures are cited showing that the above colour reactions are much more sensitive than the usual methods for the detection of small quantities of the precious metals.—A. S.

INORGANIC—QUANTITATIVE.

Flue Gases; Rapid Method for Testing —. H. Le Chatelier. *Bull. Soc. d'Encourag.*, 1904, 108, *Rev. Metall.*, 471—472.

THE author has devised the following apparatus:—Two wires of silver or platinum, 1 metre long, are fixed parallel to and electrically insulated from each other. The ends are 1 cm. apart, and are steeped in a semi-fluid mixture composed of equal weights of flax and kaolin or some pure clay, and the mass connecting the ends is then dried and calcined. This porous mass is next soaked in a 10 per cent. solution of copper nitrate, dried, and calcined till the mass blackens. It is then reduced in an illuminating-gas flame, and tested to see if it allows an electric current to pass. The open ends of the wires are then connected to the poles of a Leclanché battery, and put in circuit with a galvanometer or an electric bell. The covered ends of the wires are placed in the path of the hot flue gases, which should have a temperature of about 500° C. When there is an insufficiency of air to complete combustion, the copper oxide on the dry clay is reduced to copper, the electric current then passing, and actuating the bell or galvanometer. When there is sufficient air, no current passes, copper oxide being a bad conductor.—L. F. G.

Hydrogen Contents of Gaseous Mixtures; Method for the Continuous Determination of —, and Apparatus therefor. W. P. Thompson, Liverpool. *From Verein. Maschinenfabr. Augsburg und Maschinenbauges. Nürnberg*, A.-G., Nuremberg, Germany. *Erg. Pat.* 15,706, July 14, 1904.

THE method is based on the fact that the conductivity of hydrogen, both for heat and for electricity, is considerably greater than that of other gases, and therefore the conductivity of the gaseous mixture affords an indication of its hydrogen content. One form of apparatus consists of a wide tube, through which passes a current of the gas to be examined, and which contains a coiled tube heated by a current of some fluid (gas or liquid) which enters it at a constant temperature. From the temperature of the heated fluid as it emerges from the coiled tube the hydrogen content of the gas under examination can be calculated. In another form of apparatus, the variation in conductivity of the gaseous mixture is judged by the variation in

length of a metal rod placed in the gas and heated to a constant temperature. In a third form, the hydrogen content is ascertained by the alteration in resistance of a helix placed in the gaseous mixture, and heated by a constant electric current; whilst a fourth form consists of two electrodes fixed a certain distance apart in a tube through which the gas circulates, the variation in potential difference between the electrodes affording a basis for calculating the hydrogen content of the mixture.—T. F. B.

Phosphorus in Calcium Carbide; Determination of —. H. Lidholm. *Z. angew. Chem.*, 1904, 17, 1452—1453.

THE author finds that in the determination of phosphorus in calcium carbide by evolving and burning acetylene from it, and determining the phosphoric acid in the collected products of combustion, if dilute alcohol be used instead of water alone, the rate of evolution and combustion can be made perfectly regular. Ten grms. of the powdered sample are placed in a crucible, which is put into a very wide necked 500 c.c. flask, the cork of which carries a stoppered dropping-funnel, a tube for the entry of hydrogen, and a reflux condenser, the upper end of the latter being connected with a burner. The burner is placed under a vertical wide glass tube, connected with a wash-bottle containing water; during the experiment a strong current of air is aspirated through the wide tube and wash-bottle, in both of which are collected the products of combustion of the acetylene. The apparatus is filled with hydrogen, which is then lighted at the burner; 30 c.c. of alcohol are poured in through the funnel, and water is gradually added. When no more gas is evolved, hydrochloric acid is added, till the lime is dissolved, the liquid boiled, and the flame allowed to burn 10 minutes after all luminosity has disappeared, and the absorbing apparatus is then washed out into a beaker, with water and ammonia, the liquid filtered from any separated silica, and the phosphoric acid determined by means of magnesia mixture. Closely concordant results are said to be obtained. The solution of the lime by hydrochloric acid is merely to render the boiling safer; all the phosphorus is evolved by water alone.—J. T. D.

Chloric Acid; Determination of —. W. S. Hendrixson. *Amer. Chem. J.*, 1904, 32, 242—246.

THE author has found that metallic iron readily reduces free chloric acid even in very dilute solutions. Chlorates or bromates may be estimated by adding excess of iron in the presence of sulphuric acid. The reduction is complete in about an hour, and no heating is necessary. The iron is then oxidised with nitric acid and the halogen hydracid titrated by Volhard's method. The advantages claimed are great simplicity, and absence of errors due to heating. Perchloric acid is not reduced, so does not interfere.

—F. Sdn.

Alkali Chromates; Action of Nitric and Acetic Acids on —. [Determination of Chromium.] A. Leuba. *Ann. Chim. anal. appl.*, 1904, 9, 303—304. *Chem. Centr.*, 1904, 2, 849.

THE author finds that in the analysis of minerals containing chromium, if the melt obtained by fusing with sodium carbonate be dissolved in nitric acid, the hydroxides of iron and aluminium subsequently precipitated by ammonia always contain chromium. This is owing to the reducing action of nitric acid on the alkali chromate. By repeatedly evaporating a quantity of potassium bichromate with nitric acid, 9 per cent. of it undergoes decomposition with formation of chromium sesquioxide. Acetic acid acts in a similar manner to nitric acid.—A. S.

Iodine; Determination of — in presence of Bromine and Chlorine. E. Thilo. *Chem.-Zeit.*, 1904, 28, 866.

WHEN silver nitrate solution is added to a solution containing chloride, bromide, and iodide, the whole of the iodine is precipitated first as silver iodide, followed by the bromine, no silver chloride being formed till the whole of the bromine has been precipitated. The point at which the precipitation of the iodine is complete is determined by placing drops on a strip of filter-paper freshly wetted with dilute palladium chloride solution. The method is applied to crude iodine or

cuprons iodide as follows:—5 grms. of the substance are treated with 50 c.c. of water and 2 grms. of zinc dust, and when all the iodine is converted into zinc iodide the mixture is filtered into a 500 c.c. flask, the residue washed, transferred to a small beaker, dissolved in dilute nitric acid, excess of zinc dust added, and the mixture filtered into the flask. After making up, 50 c.c. are titrated with N/10 silver nitrate solution, till a drop gives no black spot on the palladium paper. Chlorine or bromine, if present, may now be determined in the liquid by adding a crystal of potassium chromate, titrating with the N/10 silver nitrate, adding nitric acid to dissolve the red silver chromate, filtering in a Gooch crucible, and weighing. The excess of silver in the filtrate is titrated with thiocyanate, after reducing the chromate by ferrous sulphate (and, if need be, concentrating the liquid). From the weight of the mixed precipitate, and the amount of silver it contains, the chlorine and bromine can be calculated. It is stated that relatively small amounts of iodine can be determined in presence of considerable quantities of chlorine and bromine by this method. In testing commercial potassium iodide, the silver iodide separates in a colloidal form, and the end-point cannot be determined; but the addition of 1–2 grms. of sodium chloride completely overcomes this difficulty.—J. T. D.

Gold and Silver in Zinc Ores; Crucible Charge for [Determination of] — E. J. Hall and E. Popper. *School of Mines Quart.*, 1904, 25, 355–359.

As the result of a large number of experiments, the authors conclude that, in the determination of gold and silver in zinc ores by the crucible method, the amount of litharge used should be just sufficient to give a lead button large enough to collect the gold and silver, since lead oxide in the slag seems to interfere with the complete decomposition of the ore, and prevent the formation of a slag which is free from lumps, and which can be readily poured. The amount of sodium carbonate should be from four to five times that of the ore. Borax glass should be added in amount sufficient to prevent the charge from being entirely basic, and to assist in fluxing the gangue minerals not acted on by sodium carbonate alone. If necessary, an amount of argol sufficient to reduce the whole of the litharge should be added, whilst if the ore contain more than 15 per cent. of pyrites, the addition of a couple of [iron] nails will prevent the formation of a brittle button. The following charge was found to be the most suitable one for a 20-grm. crucible, the quantities being given in A.T. (assay tons): Ore, $\frac{1}{2}$; sodium carbonate, $1\frac{1}{2}$; borax glass, $\frac{1}{2}$; litharge, $\frac{3}{4}$. The most suitable temperature is 750°–775° C., and the time required for the fusion is 30–35 minutes. The method gives good results with ores containing up to 7.5 per cent. of copper.—A. S.

Platinum-Gold-Silver Alloys; Analysis of — Hollard and Bertiaux. *Ann. Chim. anal. appl.*, 1904, 9, 287–292. *Chem. Centr.*, 1904, 2, 852.

THE authors find that by the usual methods for the analysis of platinum-gold-silver alloys, the results are too low for the gold and too high for the platinum and silver, but are very accurate for the gold and platinum together. The following method is recommended for the determination of the silver: The alloy, cut into small pieces or rolled out to a leaf, is dissolved in *aqua regia* (1 vol. of nitric acid + 5 vols. of hydrochloric acid), the solution is evaporated to the consistence of a syrup, and then evaporated to dryness three times with addition of nitric acid, the residue boiled with a few c.c. of water, 2 c.c. of nitric acid, and 2 drops of hydrochloric acid, the liquid diluted to 100 c.c., the silver chloride filtered off, washed well, dissolved in 30 c.c. of a 20 per cent. solution of potassium cyanide, the solution diluted to 150 c.c. and electrolysed. The separated silver is dissolved in nitric acid, and determined by titration with thiocyanate solution.—A. S.

Electrolysis with Rotating Cathode. H. E. Medway. *Amer. J. Science, Silliman*, 18, 56–58. *Chem. Centr.*, 1904, 2, 809.

By using the rotating platinum crucible cathode previously described (this J., 1903, 823), many metals can be separated

in a short time, by the aid of a high current density, as is shown by the following results: 0.2 gm. of cadmium was separated in 10–15 minutes from a solution slightly acid with sulphuric acid; the current density was 5–6.6 and the cathode was rotated at the rate of 650–700 revolutions per minute. Towards the end of the process, ammonia was gradually added to prevent re-solution of the deposited cadmium. Tin was completely deposited in 15–20 minutes from 20 c.c. of a solution of stannous ammonium chloride to which had been added 100 c.c. of a cold saturated solution of ammonium oxalate; current density, 6.6–12. The whole of the zinc was deposited in 25–30 minutes from 50 c.c. of a solution of zinc sulphate containing 4 grms. of potassium oxalate; current density, 6.6–8.3. Gold was completely precipitated in 25–30 minutes from 25 c.c. of a solution of the chloride, to which had been added excess of potassium cyanide and 30 drops of ammonia solution.—A. S.

ORGANIC—QUALITATIVE.

Aldehydes; Detection of —, and the Constitution of Nitrosodimethylaniline. G. Velardi. *Gaz. chim. ital.*, 1904, 34, 66–74. *Chem. Centr.*, 1904, 2, 733–734.

THE reaction of Rimini (*Gaz. chim. ital.*, 31, [1], 84), which depends upon the splitting up of Piloty's benzenesulphonohydroxamic acid, $C_6H_5SO_2NH_2OH$, in alkaline solution, into benzenesulphinic acid and nitroxyl, $:N.OH$, the latter then combining with any aldehyde present to form the corresponding hydroxamic acid, is of general applicability, and can be used for the detection of unsaturated aldehydes in complex mixtures, e.g., in natural oils. The reaction is not, however, a quantitative one, as the liberated nitroxyl also acts on unsaturated compounds at their double linkings, with formation of the corresponding oximes:— $R.CH:CH.R \rightarrow R.C(OH)CH_2R$. For the detection of aldehydes in essential oils, a few drops of the latter are heated with a trace of Piloty's acid and alcoholic potassium hydroxide solution, the mixture is cooled, diluted with water, some ether added, and then, after neutralising with hydrochloric acid, also some ferric chloride. Petitgrain, cinnamon, orange-peel, lavender, bergamot, angelica, fennel, rosemary (French), and lemon oils, among others, gave a red coloration; coriander and sassafras oils, on the other hand, a yellow coloration. The reaction with nitroxyl can also be used to ascertain the constitution of nitroso compounds, which behave in this respect like aldehydes. For instance, nitrosodimethylaniline, when treated with nitrohydroxylaminic acid, yields, on addition of barium chloride, the barium salt of dimethylaminonitrosophenylhydroxylamine, $C_6H_4.N(CH_3)_2.N(NO)OH$. It is thus a true nitroso compound of the constitution, $C_6H_4(NO)N(CH_3)_2$.—A. S.

ORGANIC—QUANTITATIVE.

Organic Matter; New [Electrolytic] Method for the Destruction of — in Toxicological Analysis. O. Gasparini. *Atti. R. Accad. dei Lincei Roma*, 1904, 13, [2], 94–100. *Chem. Centr.*, 1904, 2, 852–853.

THE substance to be analysed is covered with concentrated nitric acid, and after some time a current of 4–6 amperes is passed through. An E.M.F. of 8 volts is used.—A. S.

Petroleum; Determination of Impurities in Crude — B. Nettel. *Chem.-Zeit.*, 1904, 28, 867.

Mud from the borehole is determined by mixing a known quantity of the oil with petroleum spirit, filtering, and weighing.

Water is determined by mixing 100 c.c. of the oil with an equal volume of petroleum spirit in a stoppered separator, adding 50 c.c. of N/10 hydrochloric acid, and shaking vigorously for five minutes. The mixture is then left at rest at 65° C. for half an hour, and 25 c.c. of the separated acid are titrated with alkali. From the loss of strength of the acid, due to dilution, the amount of water in the oil is calculated. The author has proved experimentally that—1. The water in crude petroleum has neither acid nor alkaline reaction. 2. The added acid mixes thoroughly with any water present (experiments with known quantities of added water showed exactly the quantities added).

3. The crude oil has itself no reaction on the hydrochloric acid.

Solidifying Point.—The oil is cooled in a test-tube fitted with a two-holed cork. Through one hole passes the thermometer. Through the other is dropped at each degree-interval a small shot. At the solidifying point the shot remains on the surface. With dark-coloured oils the shot may be painted with zinc-white. On gradually warming the solidified oil, the melting point is indicated by the sinking of the shot.—J. T. D.

Sugars and Starch; Determination of — in Vegetable Substances. J. S. Ford. Analyst, 1904, 29, 277—279.

In the determination of sugars in substances like malt, which contain starch, it has been suggested that the material be first boiled with alcohol to destroy the enzymes present, after which the sugars can be extracted with water. The author points out that this destruction of the enzymes does not take place with alcohol of any strength, the best result being obtained with about 95 per cent. (volume) alcohol; the actual volume of alcohol taken does not appear important, provided there is sufficient to cover the substance and to boil readily. In the case of vegetable substances of an acid nature, boiling with alcohol even for half an hour gives rise to some inversion of sucrose, if present, and even with malta, slight hydrolysis occurs. If the substance be distinctly acid, a very slight excess of ammonia may be added to the alcoholic mixture before boiling.—T. H. P.

Starch Syrups; Examination of —. A. Rössing. Z. öffentl. Chem., 1904, 10, 277—279. Chem. Centr., 1904, 2, 855.

THE author's method for the determination of dextrose (this J., 1904, 386), failed in the case of three samples of starch syrup recently examined by him, the amount of dextrose found exceeding considerably the amount calculated from the direct cupric-reducing power of the sample, although by the latter method, the reducing dextrins would be returned as dextrose. No other kinds of sugar were present. The syrups in question had been prepared by means of dilute hydrochloric acid, and the inaccurate results were found to be due to the fact that when starch is hydrolysed by means of very dilute hydrochloric acid under certain conditions, the reducing power of the glucose produced is diminished by the baryta treatment (*loc. cit.*) to a considerably greater extent than is that of a normal specimen of glucose.—A. S.

Phenol; Volumetric Determination of —. F. X. Moerk. Amer. Druggist, 45, 144. Pharm. J., 1904, 73, 453.

In the ordinary method of determining phenol by treating it with excess of bromine in presence of hydrochloric or sulphuric acid, and determining the excess of bromine by adding potassium iodide and titrating with thiosulphate solution in presence of starch, the final reaction is obscured to some extent by the precipitated tribromophenol. If, towards the end of the titration, a small quantity of chloroform be added, the tribromophenol is dissolved, and the final point of the titration can be more readily observed.

—A. S.

Rhubarb; Colorimetric Valuation of —. A. Tschirch. Pharm. Centralh., 45, 496. Pharm. J., 1904, 73, 428.

THE method is based upon the hydrolysis of the anthra-glucosides and the subsequent extraction of the oxymethyl-anthraquinones by ether. 0.5 gm. of the finely-powdered rhubarb is heated for 15 minutes with 50 c.c. of 5 per cent. sulphuric acid under a reflux condenser. After cooling, the mixture is extracted with successive quantities of ether, until that solvent remains colourless when treated with a trace of potassium hydroxide. The separated aqueous liquid is then heated, to expel dissolved ether, boiled for a further 15 minutes as before, and again extracted with successive quantities of ether. When no more soluble matter is removed, the combined ethereal extracts are shaken with 200 c.c. of a 5 per cent. solution of potassium hydroxide, in successive portions, until the alkaline liquid is no longer coloured red. The red solution is diluted to 500 c.c. with distilled water, 100 c.c. are withdrawn and diluted to 1 litre, then 350 c.c. of this solution are taken and diluted to

1 litre. The depth of colour of the solution should now be about the same as that of an alkaline aloë-emodin solution of the strength of 1:1,000,000. It is matched against the colour of a solution containing a known weight of aloë-emodin rendered slightly alkaline with potassium hydroxide. Rhubarb of good quality should yield from 2.8 to 4 per cent. of oxymethylanthraquinones by this method.—A. S.

Nitrocellulose; Determination of the Stability of —. E. Bergmann and A. Junk. Z. angew. Chem., 1904, 17, 992—985, 1018—1023, 1074—1077.

THE apparatus and method described have been in use in the Prussian testing station for the past six years. The apparatus consists of a closed copper bath provided with a condenser and 10 countersunk tubes of 20 cm. length. By boiling amyl alcohol in the bath, the tubes can be kept at a constant temperature of 132° C. The explosive to be tested is placed in a glass tube 35 cm. long and 2 cm. wide, having a ground neck into which an absorption bulb is fitted. The whole apparatus is surrounded by a shield, in case of explosion. In carrying out the test, 2 grms. of the explosive are placed in the glass tube and well pressed down. The absorption bulb is half filled with water, and fitted into the ground neck of the glass tube, which is then placed in one of the tubes in the bath previously brought to the boiling point (132° C.). The evolved oxides of nitrogen are absorbed in the water in the bulb, and at the end of two hours the tubes are removed from the bath, and, on cooling, the water from the bulb flows back and wets the explosive. The contents of the tube are filtered and washed. The filtrate is oxidized with permanganate, and the nitrogen determined as nitric oxide by the Schulze-Tiemann method. The authors conclude that a stable gun-cotton does not evolve more than 2.5 c.c. of nitric oxide per gm. on being heated at 132° C. for two hours, and a stable collodion cotton not more than 2 c.c. under the same conditions. When, in the course of purification, the evolution of nitric oxide is once brought below the limits specified, further purification does not appreciably diminish the proportionate evolution of nitric oxide per gm. In the tables which follow, the figures represent c.c. of nitric oxide per gm. on heating at 132° C. or two hours.

Pulping and Washing.—The influence of these two processes is shown in the following table:—

	Collodion Cotton.		Guncotton.	
	1 Hour.	2 Hours.	1 Hour.	2 Hours.
Half pulped	c.c.	c.c.	c.c.	c.c.
Fully pulped	0.8	1.7	1.5	2.8
5 changes hot water....	0.7	1.7	0.9	2.2
50 " "	0.7	1.5	0.8	2.4

Moisture.—The percentage of moisture in the sample to be tested should be kept as low as possible. A nitrocellulose containing 1.97 per cent. of moisture gave an evolution of 2.6 c.c. per gm., while the same sample with 3.4 per cent. of moisture gave an evolution of over 50 c.c. per gm.

Sodium Carbonate.—Under the conditions of the experiment, the addition of dry sodium carbonate to an unstable nitrocellulose diminishes the rate of decomposition. If sodium carbonate be intimately mixed with a stable nitrocellulose, the rate of decomposition will be increased. The following table shows the effect of sodium carbonate under different conditions:—

Conditions.	Stable Nitrocellulose, 2 Hours.	Unstable Nitrocellulose, 2 Hours.
Without addition.....	c.c.	c.c.
+ 5% dry Na ₂ CO ₃	2.5	23.9
+ 10% " ".....	2.5	13.3
+ 5% Na ₂ CO ₃ ·10H ₂ O.....	2.5	7.1
+ 10% " ".....	2.5	7.0
+ 5% Na ₂ CO ₃ dissolved in water	5.2	7.1
	16.8	18.2

Calcium Carbonate and Mercuric Chloride.—These two bodies showed practically no influence on the rate of decomposition.

Alcohol.—When an unstable nitrocellulose is extracted for a short time with alcohol a stable compound is immediately produced.

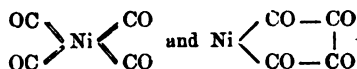
Solubility in Ether-Alcohol.—The percentage solubility of a nitrocellulose rises on heating at 132° C. A sample which before heating had a solubility of 4.7 per cent., had its solubility increased to 82.5 after six hours' heating. See also this J., 1903, 511, 924 and 1208; 1902, 687—689, 819—825 and 1470—1; 1901, 8—13, 609—617 and 1555—6; 1899, 174 and 857—8; 1898, 1180; 1897, 283—290.

—G. W. McD.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Nickel Carbonyl; Constitution of —. H. O. Jones. Brit. Assoc., 1904. Chem. News, 1904, 90, 144—145.

NICKEL carbonyl reacts like a ketonic substance in that it forms compounds with hydroxylamine and hydrazine. It also reacts with Grignard's alkyl-magnesium iodides yielding products containing nickel, magnesium and iodine. With phenyl-magnesium iodide it yields a product, which when treated with acids gives rise to a mixture consisting chiefly of diphenyl and benzoin. All reactions of nickel carbonyl which have been described previously can be equally well explained by means of either of the two formulae—



but benzoin should theoretically be formed in a much simpler way from a compound with the second formula.—A. S.

Titanium and Tin Compounds; Some —. F. Emich. Monatsh. Chem., 1904, 25, 907—912.

BARIUM-TITANIUM fluoride, $2\text{BaTiF}_6 \cdot \text{H}_2\text{O}$, was prepared by treating a solution of potassium-titanium fluoride with the requisite quantity of barium chloride solution, in a platinum dish, and filtering off and washing the barium compound. On strongly heating the barium titanium fluoride in a platinum retort connected with a platinum U-tube cooled by a mixture of solid carbon dioxide and ether, there was found, in the neck of the retort after cooling, a white transparent substance, soluble in water and consisting of titanium fluoride.

The author found the solidifying point of titanium chloride to be -23°C ., and the boiling point of tin tetraiodide, 341°C . (corr.).

A quantitative yield of potassium tin fluoride $\text{K}_2\text{SnF}_6 \cdot \text{H}_2\text{O}$ can be obtained by treating a solution of 27 grms. of tin tetrachloride in 270 c.c. of water with a warm solution of 57 grms. of crystallised potassium fluoride in 170 c.c. of water. The precipitated tin compound is recrystallised from boiling water and washed with cold water till free from chlorine. Barium-tin fluoride can be prepared in a similar manner.—A. S.

Acetylides; Double —. A. E. Edwards and W. R. Hodgkinson. Brit. Assoc. 1904. Chem. News, 1904, 90, 140.

THE authors describe the action of acetylene on some silver salts. A number of organic salts such as silver acetate, benzoate and butyrate, yielded the same acetylide as that obtained from a neutral or faintly alkaline solution of silver nitrate. From a solution of silver nitrate in nitric acid of sp. gr. 1.3, an acetylide containing nitric acid as nitrate was obtained. Silver salts dissolved in potassium cyanide or in thiosulphate solution were not acted upon by acetylene. The product obtained by the action of acetylene on pure silver thiocyanate suspended in water, is explosive. It contains both sulphur and cyanogen, but it was not obtained in a pure state. From a boiling solution of silver bichromate, acetylene precipitates an orange-red salt of the

composition $(\text{Ag}_2\text{O} \cdot \text{C}_2\text{H}_2 \cdot \text{Ag}_2\text{CrO}_4)$, whilst chromic acid is liberated. When dry the salt is very sensitive to friction, and explodes violently at 157°C . The corresponding compounds from silver sulphate, selenate, tungstate, and molybdate are all much less sensitive than that from the bichromate, and explode much more feebly. The composition of the products obtained from silver phosphate and vanadate was not determined satisfactorily; the compounds explode in a very feeble but peculiar manner.—A. S.

Enzymes; Origin of —. C. Beckenhaupt. Woch. f. Brau., 1904, 21, 548—551.

THE author quotes the results of several recent investigations which tend in his opinion to support the view that the activity of enzymes is a function connected in some manner with the mineral constituents of the medium. It is suggested that the enzymes are formed by the combination of an albuminoid or nitrogenous molecule, such as asparagin, with certain mineral constituents, the latter playing an important part, which part is determined by "molecular vibrations" under the influence of external forces, such as moisture, heat, &c.—J. F. B.

New Books.

ANLEITUNG ZUR VERARBEITUNG DER NAPHTHA UND IHREER PRODUKTE. Von N. A. KWJATKOWSKY, Chem. und Ing. in Moskau. Autorisierte und Erweiterte deutsche Ausgabe. Von M. A. BAKUSIN. Julius Springer, Monbijoup'atz 3, Berlin, N. 1904. Price M. 4.

8vo volume containing subject matter filling 138 pages, followed by a bibliographic index (5 pages) and two tables. The text is illustrated with 13 engravings. The treatment of the subject may be classified as follows:—I. Historical, Statistical and Geographical; Petroleum industry in Baku, &c. II. Origin and Occurrence of Petroleum. III. Chemical Condition and Physical Properties of Petroleum. IV. Distillation of Petroleum and Petroleum Spirit, and Apparatus required. V. Distillation of Petroleum Residues, Apparatus, Increasing the Yield of Machine Oils, &c. VI. Decomposition of Crude Petroleum Naphtha in preparing Aromatic Hydrocarbons and Illuminating Oils. VII. Refining the Kerosine Distillate, &c. VIII. Refining the various Petroleum Fractions. IX. Purification of Lubricating Oil Distillates. X. Testing the Goods and their Properties, Apparatus required. XI. The different Commercial grades of Petroleum Products. XII. Storage of Petroleum oils, &c. XIII. (Appendix) Utilisation of the Spent Acids and Alkali Lyes.

THE INDUSTRIAL AND ARTISTIC TECHNOLOGY OF PAINT AND VARNISH. By ALVAH H. SABIN, M.S., Lecturer in New York University and the Massachusetts Institute of Technology, &c. First Edition. John Wiley and Sons, New York. Chapman and Hall, Ltd., 1904. Price 12s. 6d.

LARGE 8vo volume, containing 364 pages of subject matter, and the alphabetical index. The text contains numerous illustrations, and may be classified as follows:—I. Introduction. II. Early History. III. Varnish, Etymology. IV. and V. Linseed Oil. VI. Manufacture of Varnish. VII. Tung Oil. VIII. Japans and Driers. IX. Rosin. X. Spirit Varnishes. XI. Pyroxylin Varnishes. XII. Oil-paints and Paints in Japan. XIII. Varnish or Enamel Paints. XIV. Chinese and Japanese Lacquers. XV. Protection of Metals from Corrosion. XVI. Water-pipe Coating. XVII. Ships' Bottom Paints. XVIII. Ship and Boat Painting. XIX. Carriage Painting. XX. House Painting. XXI. Furniture Varnishing.

FOOD INSPECTION AND ANALYSIS FOR THE USE OF PUBLIC ANALYSTS, HEALTH OFFICERS, SANITARY CHEMISTS, AND FOOD ECONOMISTS. By ALBERT E. LEACH, S.B., Analyst of the Massachusetts State Board of Health. First Edition. John Wiley and Sons, New York. Chapman and Hall, Ltd., London. 1904. Price 31s. 6d. nett.

LARGE 8vo volume containing 770 pages of subject matter with 119 illustrations, and at the close of the work and following the alphabetical index, 40 plates giving microphotographs of cereals, legumes, miscellaneous starches, tannerie, sago, coffee, tea, chicory, cocoa, spices, and fats. The subjects treated may be generally gathered from the following chapter headings:—I. Food Analysis and State Control. II. The Laboratory and its Equipment. III. Food, its Functions, Proximate Components and Nutritive Value. IV. General Analytical Methods. V. The Microscope in Food Analysis. VI. Milk and Milk Products. VII. Flesh Foods. VIII. Eggs. IX. Cereals and their Products, Legumes, Vegetables, and Fruits. X. Tea, Coffee, and Cocoa. XI. Spices. XII. Edible Oils and Fats. XIII. Sugar and Saccharine Products. XIV. Alcoholic Beverages. XV. Vinegar. XVI. Artificial Food Colours. XVII. Food Preservatives. XVIII. Artificial Sweeteners. XIX. Canned and Bottled Vegetables, Relishes, and Fruit Products.

LABORATORY MANUAL OF ORGANIC CHEMISTRY FOR BEGINNERS. By Dr. A. F. HOLLEMAN. Appendix to Author's Text Book of Organic Chemistry. Translated from the Dutch by A. JAMIESON WALKER, Ph.D., B.A. With the co-operation of the Author. First Edition. John Wiley and Sons, New York. 1904. Price 4s. 6d. Chapman and Hall, Ltd., Henrietta Street, Covent Garden, London, W.C.

SMALL 8vo volume containing 69 pages of subject matter with two illustrations, and an alphabetical index. It is a concise manual of qualitative reactions of organic compounds, and forms the companion volume of Holleman's Text Book of Organic Chemistry, also translated by A. J. Walker (see this J., 1903, 659).

Trade Report.

I.—GENERAL.

PATENTS ACT, 1902; OFFICIAL NOTICE RELATING TO THE —.

Examination of Previous Specifications.

The following notice appeared in the *Illustrated Official Journal (Patents)* of 21st September:—

The Board of Trade, in pursuance of the provisions of section 1, subsection 11, of the Patents Act, 1902, do hereby fix the 1st January, 1905, as the date for the coming into operation of section 1 of the above-mentioned Act, and do order accordingly.

BELGIUM; TRADE OF — WITH THE UNITED KINGDOM IN 1903.

Foreign Office Annual Series, No. 3275.

The following figures give the quantities in tons of certain articles imported into Belgium from the United Kingdom during 1903, the figures for 1902 being added in brackets:—

Bitumen and resin, 129,857 (141,699); chemical products, 89,989 (38,159); dyestuffs, 10,849 (18,571); lard and tallow, 5409 (5049); minerals, 114,409 (127,241); oil cake, 9886 (7867); oil seeds, 4946 (5111); salt, 21,810 (24,552); soap, 8075 (2482); vegetable oils, 10,283 (13,464).

Among the exports from Belgium which came to the United Kingdom were chemical products, 50,275 (57,692); dyestuffs, 7427 (7892); glass, 87,316 (92,187); lard and tallow, 8628 (2723); minerals, 421,095 (includes cement, 208,159) (387,675); paper, 16,810 (15,161); resin and

bitumen, 5801 (4809); starch, 7550 (7537); sugar, 48,887 (41,280); vegetable oils, 10,229 (11,455); zinc, 38,120 (42,294).

UNITED STATES; TRADE OF — IN 1903-4.

Foreign Office Annual Series, No. 3279.

Subjoined is a list of certain articles imported into the United States during the fiscal year ended June 30, 1904, with the value in dollars, and the sources of supply in order of importance:—

Article.	Value.	Countries of Origin.
Cement.....	Dols. 1,998,303	Germany, Belgium, United Kingdom.
Chemicals, drugs, and dyes—		
Dyes.....	634,702	Germany, United Kingdom.
Wine lees.....	2,550,223	Italy, France, Portugal.
Quinine bark.....	801,375	Netherlands, United Kingdom.
Coal-tar colours and dyestuffs.	4,918,505	Germany, Switzerland, United Kingdom.
Dyewoods, logwood.	663,572	British West Indies, France, United Kingdom, Switzerland.
Glycerin.....	2,583,270	France, United Kingdom.
Gums—		
Copal, cowrie, and dammar.	2,187,223	British Oceania, British East Indies, Dutch East Indies, United Kingdom.
Gambier.....	1,251,782	British East Indies, United Kingdom.
Shellac.....	3,405,229	British East Indies, United Kingdom.
Indigo.....	1,282,407	Germany, British East Indies, United Kingdom.
Bleaching powder...	772,532	United Kingdom, Germany, France.
Potassium chloride..	2,407,957	Germany, Belgium, United Kingdom.
Potassium nitrate...	346,524	British East Indies.
Quinine sulphate...	852,164	Germany, Dutch East Indies, United Kingdom.
Caustic soda.....	74,072	United Kingdom, Germany.
"Sal soda".....	20,865	United Kingdom.
Soda ash.....	188,750	United Kingdom.
Sulphur.....	3,229,539	Italy, Japan, United Kingdom.
Sumac.....	274,801	Italy, United Kingdom.
Vanilla beans.....	1,424,647	Mexico, France, French Oceania, United Kingdom.
Earthenware and china.	12,005,008	United Kingdom, Germany, France.
Leather.....	4,908,231	Germany, United Kingdom, France.
Oil—		
Animal—		
Whale or fish.....	638,591	Canada, Scandinavia, United Kingdom, Germany.
All other.....	34,830	United Kingdom, Canada, Germany.
Mineral.....	280,746	United Kingdom, Canada.
Vegetable—		
Olive, &c.	1,875,825	Italy, France, Spain, United Kingdom.
All other.....	5,982,702	United Kingdom, British East Indies, Germany, Spain, Italy, France.
Volatile or essential...	2,396,745	France, Italy, Germany, United Kingdom, Turkey, British East Indies.
Paints.....	1,674,019	Germany, United Kingdom, France.
Paper stock, rags.....	1,511,835	Germany, United Kingdom, Belgium, France.
Paper and manufactures thereof.	5,310,086	Germany, United Kingdom, France, Belgium.
Plumbago.....	991,134	British East Indies, United Kingdom, Italy, Canada.
Salt.....	515,230	United Kingdom, British West Indies, Italy, Dutch West Indies.
Plate glass.....	979,819	Belgium, Germany, United Kingdom, France.
Other glass and glassware	5,603,319	Belgium, United Kingdom, Germany.
Glue.....	598,546	United Kingdom, France, Germany.
Indiarubber—		
Unmanufactured.....	42,214,219	Brazil, United Kingdom, Belgium, Germany, Portugal.
Manufactured.....	1,157,042	Germany, United Kingdom, France, Belgium.
Iron ore.....	1,503,279	Cuba, Canada, Spain.

Articles.	Value.	Countries of Origin.
Sugar, &c.— Molasses.....	Dols. 1,018,196	Cuba, British West Indies, San Domingo, Canada.
Sugar.....	71,409,639	Cuba, Dutch East Indies, British West Indies, British Guiana, San Do- mingo.
Tin.....	21,486,511	British East Indies, United Kingdom, Netherlands, Italy, Germany, British Australasia.
Soap.....	900,841	United Kingdom, France, Germany.

Among the exports during the same period were:—Chemicals, drugs, and dyes, 14,474,823 dols. (1903, 13,697,601); hides and skins, 6,414,638 dols. (1903, 5,290,948); paints, 2,756,581 dols. (1903, 2,350,937); glass and glassware, 1,978,481 dols. (1903, 2,150,699).

BELGIUM; CHEMICAL INDUSTRY IN —.

Foreign Office Annual Series, No. 3275.

The glass exports, which were so well maintained in 1902, showed a considerable decline in value during 1903, the actual loss on the comparison being 122,720*l*. This decrease was mainly due to the lessened demand from the United Kingdom, the United States, Germany, Australia, Canada, and Japan. The total volume of the exports of glass from Belgium in 1903 was 237,501 tons, with a value of 3,578,190*l*.

The cement industry, as far as the export trade was concerned, made good progress, the figures being 599,091 tons, with a value of 623,040*l*., increases of 10 per cent. on the volume and 2.5 per cent. on the value over 1902. The countries to which large quantities of this material were exported were the United Kingdom (209,159 tons valued at 216,484*l*.), Canada (29,717 tons), Cape Colony (22,906 tons), the United States (90,137 tons), and the Netherlands (51,308 tons).

The decline noted in the sugar exports of 1903 continued during 1903, and the total exports fell from 134,394 tons in 1902 to 116,655 tons in 1903, this latter quantity being exactly half the amount of the volume exported in 1901.

V.—PREPARING, BLEACHING, Etc., TEXTILES, YARNS, AND FIBRES.

WEIGHTING OF SILK; EFFECT OF EXCESSIVE — ON THE PRESENT POSITION OF THE SILK INDUSTRY.

A. Bolis. Chem. Zeit., 1904, 28, 796—797.

The present depressed state of the silk-manufacturing industry is attributed to a variety of causes, namely, the high price of raw silk, competition of Tusseh and "artificial" silks, and of mercerised cotton, and other causes, but especially to the loss of confidence in the durability of silk fabrics which has been brought about by the practice of excessive weighting. Weightings may be divided into three classes, according to the proportions employed, namely, those amounting to (1) not more than 50 per cent., (2) from 50 to 150 per cent., and (3) from 150 to 300 per cent. of the weight of the silk. Only the first of these, it is considered, should be used. To control the practice of weighting, the author advocates, with Pinchetti, the establishment, in all silk-manufacturing centres, of public laboratories, where the nature of the weighting agents used could be examined, and their amount determined. Moreover, it is believed that much useful work could be done by such laboratories in investigating the action of weighting agents on the tenacity, &c. of the fibre, and in fixing with some degree of precision, the proportion of charge which may be safely allowed.—E. B.

VII.—ACIDS, ALKALIS, Etc.

GYPSUM PRODUCTION OF THE UNITED STATES.

Eng. and Mining J., Sept. 15, 1904.

According to the *Geological Survey*, the output of gypsum in the United States in 1903 was 1,041,704 short

tons, valued at 3,792,943 dols., as against 816,478 short tons, valued at 2,089,341 dols., in 1902. The production is reported as crude gypsum, land plaster, plaster of Paris, and wall plaster, according to the condition in which the gypsum first reaches the market. The figure given as that of the total production is, therefore, an estimate arrived at by computing the whole output as crude gypsum. The total value given is that of the product in its different forms as it reaches the market.

IX.—BUILDING MATERIALS, Etc.

CEMENT INDUSTRY IN CANADA.

Eng. and Mining J., Sept. 15, 1904.

The Portland cement industry is making rapid strides in Canada, and the time is approaching when the requirement of that country will be supplied entirely by domestic manufacturers. The chief centre of the industry is in Ontario, which made 695,360 barrels in 1903, as compared with 31,924 barrels ten years ago. There were nine plants in operation and four under construction.

X.—METALLURGY.

IRON AND STEEL PRODUCTION OF FRANCE DURING THE FIRST SIX MONTHS OF 1904.

Ed. of Trade J., Sept. 29, 1904.

The French *Journal Officiel* of 25th September publishes statistics relating to the production of iron and steel in France during the first six months of 1904, with comparative figures for the corresponding period of the preceding year, on which the following table is based:—

	First Six Months.	
	1903.	1904.
	Tons.	Tons.
Cast iron—		
Forge pig	1,095,120	1,143,214
Foundry pig	270,301	287,423
Total	1,365,421	1,430,637
Iron—		
Wrought iron (various)	226,554	261,910
Sheets	23,191	17,554
Total	318,745	279,264
Steel—		
Rails	118,541	137,419
Wrought steel (various)	394,740	464,129
Sheets	153,320	146,911
Total	666,571	751,650
Bessemer and Siemens-Martin ingots	942,658	1,042,673

SARDINIA; MINERAL PRODUCTION OF —.

Foreign Office Annual Series, No. 3268.

The following table gives the quantity and value of minerals produced in Sardinia in 1903:—

Minerals.	Quantity.	Value.
	Tons.	£
Zinc—		
Calamine.....	112,547	528,410
Blende	11,323	46,020
Lead	40,761	207,475
Silver.....	401	9,452
Arsenic.....	49	190
Manganese	742	830
Antimony	1,385	4,494
Lignite	26,187	14,246
Anthracite		
Copper	20	141
Ochre	742	1,212
Total	193,147	810,333

109,223 tons of zinc ore were exported, and also 82,580 tons of lead ore and 3154 tons of pig lead.

146,990 tons of salt were mined during the year; the export amounted to 5244 tons.

XII.—FATS, FATTY OILS, Etc.

OIL-SEED AND OIL-CAKE EXPORTS FROM ODESSA.

Foreign Office Annual Series, No. 3277.

Ravison is the most important oil-seed as regards the export trade, 53,000 quarters being exported from Odessa during the period between August 1, 1903, and June 1904. The bulk of this was shipped to Hull. Very little business was done in rape seed or colza from this port, and only 2,000 quarters of colza were exported from Odessa (all to Rotterdam and Marseilles) during the same period, while the total amount of rape seed shipped from the port (to Hull and Rotterdam) was 1100 quarters. The prospects for rape seed and colza this year, both as regards quantity and quality, are poor.

The following comparative table shows the quantities exported in 1901-3 inclusive:—

Articles.	Quantity.		
	1901.	1902.	1903.
	Tons.	Tons.	Tons.
Linseed	935	4,922	2,502
Hemp seed	1,863	3,170	1,501
Ravison	1,548	..	14,150
Mustard seed .....	..	100	31
Colza .....	..	187	..
Other oil seeds	1,144	3,778	536
Total	5,480	11,253	19,120

32,048 tons of oil cake were exported in 1903, compared with 30,450 tons in 1902, and 29,518 tons in 1901; of these quantities, the following came to the United Kingdom:—1903, 4900 tons; 1902, 5370 tons; 1901, 7560 tons.

OLIVE OIL PRODUCTION OF SARDINIA.

Foreign Office Annual Series, No. 3268.

The production of olive oil in the province of Cagliari, which was very small in the preceding years owing to the invasion of the *Mosca olearia* (olive fly), has increased now this insect has disappeared, and it reached 606,345 galls. in 1903; the province of Sassari produced 748,429 galls.—a total of 1,354,774 galls., compared with 1,175,280 galls. in 1902, and 1,120,258 galls. in 1901.

XV.—MANURES, Etc.

CHEMICAL MANURES; CONSUMPTION OF — IN ITALY.

Foreign Office Annual Series, No. 3265.

The amount of chemical manures consumed annually in Italy is about 477,500 metric tons. Superphosphates are prepared and consumed in large quantities. The annual consumption of phosphates in Italy is at present about 400,000 metric tons, whereof 370,000 metric tons are mineral phosphates, the remainder being prepared with bone powder or with bone ashes. The greater part of the phosphates is prepared at the 50 more or less important factories in Italy. The quantities imported from France, the United Kingdom, and Belgium are no longer very considerable. Thomas slag is imported from Luxembourg, Belgium, and in smaller quantities from the United Kingdom. The consumption thereof has increased considerably during the last few years. Bone dust is used to a certain extent in its natural state without any special preparation, but it is not of much importance. The consumption of sodium nitrate in Italy is not so important as in other countries, but it is on the increase, and has already reached 20,000 metric tons, almost all from Chili. Italian agriculture also consumes about 12,500

metric tons of ammonium sulphate annually. It comes mostly from the United Kingdom. Italy produces barely one-third of the consumption. The consumption of potassium sulphate and chloride is still limited as compared with the consumption of other manures. Owing to the high cost of transport they are used almost in a pure state. The importation amounts to about 3,000 metric tons, and is from Stassfurt. In addition to these, large quantities of nitrogenous organic manures, such as guano, blood, dried meat, horns, refuse from tanneries, &c., are used in Italy for agricultural purposes. It is difficult to give the exact quantity used, but there is no doubt that its value amounts to several millions of francs per annum.

XVI.—SUGAR, STARCH, Etc.

SUGAR PRODUCTION OF FRANCE.

Bd. of Trade J., Sept. 29, 1904.

The *Journal Officiel* of 13th September contains statistics of the production of sugar in France during the 1903-4 campaign (1st September, 1903, to 31st August, 1904). In 1903-4 the number of sugar factories working in France was 292, as compared with 319 during the previous campaign. The total quantity of sugar despatched from the factories (expressed in terms of refined sugar) amounted to 769,291 metric tons in 1903-4, as compared with 825,274 metric tons in 1902-3.

SUGAR PRODUCTION OF GERMANY.

Bd. of Trade J., Sept. 22, 1904.

The *Reichsanzeiger* for September 14th publishes statistics of the production of sugar in Germany during the campaign 1903-4. In 1903-4 the quantity of raw beet used in sugar manufacture was 12,706,527 metric tons, as compared with 11,255,958 metric tons during the 1902-3 campaign; the amount of raw sugar produced in 1903-4 was 1,662,814 metric tons, against 1,503,703 metric tons in 1902-3; whilst the production of refined sugar amounted to 1,411,129 metric tons in 1903-4, as compared with 1,367,086 metric tons in 1902-3. The total output of sugar (raw and refined) during the period from September, 1903, to August, 1904, expressed in terms of raw sugar, was 1,929,415 metric tons, as compared with 1,755,897 metric tons in the corresponding months of 1902-3.

XVII.—BREWING, WINES, SPIRITS, Etc.

ALCOHOL; DUTY-FREE —.

Pharm. J., Sept. 24, 1904.

The following statement has lately been issued by the Treasury Department:—

Return for the Years 1902-3 and 1903-4, respectively, showing the Applications for Exemption for (1) Trade Purposes; (2) Scientific or Educational Purposes.

	1902-3.	1903-4.
Applications for trade purposes:—		
Number received	54	30
" granted	8	14
Quantity of spirit on which exemption was granted	*341	*206,452
Applications for scientific or educational purposes:—		
Number received	65	53
" granted	49	127
Quantity of spirit on which exemption was granted	*358	*2,373

* These figures represent the total number of proof gallons of spirits used duty-free for the respective purposes in the year to which the figures relate.

† These numbers are in addition to the applications granted in the previous year, the privilege not being limited to one year, but continuing year by year until revoked.

SPIRIT (BRANNTWEIN), AND WASTE LIQUORS FROM ITS RECTIFICATION; UNTAXED DELIVERY OF — FOR TECHNICAL PURPOSES IN RUSSIA.

Z. Spiritusind., 1904, 27, 381.

By an order of the Imperial Council, confirmed by the Tsar, and dated May 12, 1903, the Russian Minister of Finance was authorised to allow, experimentally for three years, the untaxed delivery of spirit and of waste liquors from spirit rectification, in the denatured condition, for technical purposes, for lighting, heating, and power purposes, for the preparation of pharmaceutical products, for hygienic and medicinal purposes, and for disinfection, and to fix the conditions under which the delivery and the use of denatured untaxed spirit can be permitted. According to the regulations issued on June 18, 1903 by the Minister of Finance, spirit which is to be denatured for the above mentioned purposes must have an alcohol content not less than 85° Tralles. If, instead of ordinary raw spirit, a product containing more than 1 per cent of fusel oil is denatured, this fact must be stated upon the containing vessel when such denatured spirit is sold. Spirit for heating, lighting, and power purposes, &c., must be denatured as usual by the addition of a mixture of substances according to the prescription of the Technical Committee of the Department of Indirect Taxation; spirit for technical purposes, in which the ordinary denaturing process cannot be applied, can be denatured by other means, to be specially defined for each case. Mixtures for the ordinary denaturing process are to be bought at the bonded spirit warehouses; materials for special denaturing processes may be purchased privately, but, before being used, must be submitted to examination in the Central Chemical Laboratory of the Ministry of Finance or in the Laboratory of the Government Excise Department. The amount of spirit to be denatured must in each case be not less than 10 wedro (123 litres).—A. S.

XIX.—PAPER, PASTEBOARD, Etc.

PULP AND PULP WOOD; CANADIAN EXPORT OF —.

U.S. Cons. Reps., No. 2058, Sept. 17, 1904.

The statistics for the fiscal year 1904 show that, while the export of wood pulp from Canada decreased, the export of the raw material (pulp-wood), all of which goes to the United States, increased. The value of total export of pulp-wood in 1904 was 1,758,049 dols., an increase over 1903 of 229,489 dols. The total export of pulp decreased 23 per cent., the value being 2,409,074 dols., against 3,150,943 dols. during the previous year. The falling off was chiefly in the export to Great Britain, the value of which decreased 51 per cent., from 1,129,173 dols. to 548,720 dols., while the value of exports to other countries fell from 226,002 dols. to 53,912 dols. The value of Canada's total exports of paper, however, rose from 849,519 dols. to 1,097,212 dols., an increase of 247,693 dols., or 29 per cent. of the total value of the exports during 1903. Great Britain took 447,672 dols. worth; the United States, 163,000 dols. worth; and other countries, 486,531 dols. worth.

XXII.—EXPLOSIVES, MATCHES, Etc.

EXPLOSIVES IMPORTED INTO NATAL.

Bd. of Trade J., Sept. 29, 1904.

A Government notice (No. 554 of 1904) issued by the Natal Colonial Secretary, on Aug. 22, 1904, lays down the tariff fees payable for the examination by the Government chemist of dynamite and other explosives imported into Natal, as follows:—For the first 100 cases of dynamite or other explosive, 10s.; for every additional 100 cases or part of 100 cases, 5s. One sample from each 100 cases or part of 100 cases must be sent to the Government laboratory for examination, and cases of detonators will be regarded as separate shipments of explosives.

Patent List.

N.B.—In these lists, [A.] means "Application for Patent," and [O.S.] "Complete Specification Accepted."

Where a Complete Specification accompanies an Application, an asterisk is affixed. The dates given are (i) in the case of Applications for Patents, the dates of application, and (ii) in the case of Complete Specifications Accepted, those of the Official Journals in which acceptances of the Complete Specifications are advertised.

Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, AND MACHINERY.

- [A.] 20,154. Hecht and Rott. Safety containers for inflammable liquids.* Sept. 19.
- " 20,184. Thompson (Matricardi). Furnaces. Sept. 19.
- " 20,276. Aktiebolaget Separator. Centrifugal separators. [Appl. in Sweden, Oct. 3, 1903.]* Sept. 20.
- " 20,297. Campbell. Furnaces. Sept. 20.
- " 20,641. Parry. Machinery for separating pulverulent and granular substances from mixtures containing same. Sept. 26.
- " 20,857. Kostalek. Filters.* Sept. 28.
- " 20,939. Shiels. Apparatus for heating, cooling, evaporating, condensing, &c. Sept. 29.
- " 20,942. The Cotton Seed Co., Ltd., and Stanley. Drying apparatus. Sept. 29.
- " 20,984. Pearson. See under XVIII. B.
- " 21,052. Oakley. Washing machine. Sept. 30.
- " 21,088. Wilkins and Overend. See under X.
- [C.S.] 22,057 (1903). Doyle. Furnaces. Sept. 28.
- " 28,525 (1903). Mechwart. Filtering apparatus. Oct. 5.
- " 642 (1904). Pidgeon. Rousers for mixing purposes. Oct. 5.
- " 15,389 (1904). Czapikowski. Filters. Oct. 5.
- " 16,588 (1904). Matcham. Combined rotary kilns and dryers. Sept. 28.
- " 17,270 (1904). France. Sprinkler for liquids, semi-liquids, and pulverulent materials. Sept. 28.
- " 17,772 (1904). Forbes. Filtering apparatus. Oct. 5.
- " 17,957 (1904). Tobler and Rheinische Webstuhl und Appretur Maschinenfabr. Drying apparatus. Oct. 5.

II.—FUEL, GAS, AND LIGHT.

- [A.] 20,125. Hawliczek. Recovery of by-products resulting from the destructive distillation of coal in "bee-hive" coking ovens. Sept. 19.
- " 20,277. Abel (Siemens und Halske A.-G.). Manufacture of incandescence bodies for electric glow lamps. Sept. 20.
- " 20,326. Craig. See under VII.
- " 20,371. Kincker and Wolter. Production of oil gas.* Sept. 21.
- " 20,784. Chalk Power Gas Synd., Ltd., and Pearson. Process for the continuous and concurrent production of fuel gas and lime. Sept. 27.
- " 20,845. Wilson. Gas producers. Sept. 28.
- " 20,870. Koppers. Process of and apparatus for obtaining by-products in the dry distillation or gasification of fuel.* Sept. 28.
- [C.S.] 21,360 (1903). Shedlock. Artificial fuel and the manufacture thereof. Oct. 5.
- " 24,588 (1903). Settle and Padfield. Manufacture of coal gas. Oct. 5.
- " 18,262 (1904). Koppers. Coke ovens. Oct. 5.
- " 18,291 (1904). Cotton. Process and apparatus for generating a combustible gas from carbonaceous liquids. Oct. 5.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM, AND MINERAL WAXES.

- [A.] 20,697. Imray (Meister, Lucius und Brüning). Process for purifying orthonitrotoluene. Sept. 26.
 „ 20,870. Koppers. *See under II.*

IV.—COLOURING MATTERS AND DYESTUFFS.

- [A.] 20,527. Newton (Bayer and Co.). Manufacture of new anthracene dyestuffs suitable for dyeing and printing. Sept. 28.
 „ 20,697. Imray (Meister, Lucius und Brüning). *See under III.*
 [C.S.] 24,409 (1903). Ransford (Cassella and Co.). Manufacture of *o*-nitro-*o*-amido-*p*-acetamidophenol, and dyestuffs therefrom. Sept. 28.
 „ 25,541 (1903). Newton (Bayer and Co.). Manufacture of oxyanthraquinones. Oct. 5.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

- [A.] 20,178. Johnson (Badische Anilin und Soda Fabrik). The discharge of dyed textile fabrics. Sept. 19.
 „ 20,513. Sutherland. Method of cleansing or degumming stalk fibres. Sept. 23.
 „ 20,637. Valette. Manufacture of artificial silk.* Sept. 26.
 „ 20,664. Ward and Kenworthy. Apparatus for dyeing and treating textile fabrics and materials. Sept. 26.
 „ 21,079. Calico Printers' Assoc., Ltd., Bryce-Smith and Haason. Printing woven fabrics. Oct. 1.
 [C.S.] 20,673 (1903). Müllers and Spindler. Manufacture of figured plush. Sept. 28.
 „ 20,942 (1903). Nayer. Dyeing vats. Oct. 5.
 „ 17,240 (1904). Destrée and Wiescher. Dyeing of hanks or yarns. Oct. 5.
 „ 17,242 (1904). Kraiss and The Bradford Dyers' Association, Ltd. Finishing piece goods. Oct. 5.

VII.—ACIDS, ALKALIS, AND SALTS.

- [A.] 20,195. Imray (Meister, Lucius und Brüning). *See under XX.*
 „ 20,241. Fryklind. Process for producing ammonia or ammonium salts from nitrogenous organic substances containing a high percentage of water. Sept. 20.
 „ 20,326. Craig. Obtaining carbonic acid gas from the products of carbonaceous combustion, and apparatus therefor. Sept. 21.
 „ 20,652. Hargreaves. Production of sulphate of baryta. Sept. 26.
 „ 20,784. Chalk Power Gas Synd., Ltd., and Pearson. *See under II.*
 „ 20,835. Hargreaves. Generation and application of chlorine. Sept. 28.
 „ 20,952. Eschelman, Harmuth, and Tov. Tentelerskago Khimichesk Zavoda. Apparatus for the manufacture of sulphuric anhydride.* Sept. 29.
 [C.S.] 24,806 (1903). Hinz. *See under XI.*
 „ 26,668 (1903). Meurer. Producing metal sulphates or other salts from metal sulphides and sulphide ores containing iron. Oct. 5.
 „ 4487 (1904). Granier. *See under XI.*

VIII.—GLASS, POTTERY, AND ENAMELS.

- [A.] 20,879. Bredel. Manufacture of quartz glass from quartz sand, silica, and the like.* Sept. 28.
 „ 20,880. Bredel. Manufacture of articles from quartz glass.* Sept. 28.

- [C.S.] 25,686 (1903). Stanley and Jeffcote. Process and apparatus for applying glazes, enamels, and bodying material to bricks, tiles, and like goods. Oct. 5.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

- [A.] 21,018. Bottomley and Paget. Attachment of metals to fused silica and analogous materials. Sept. 30.
 [C.S.] 25,686 (1903). Stanley and Jeffcote. *See under VIII.*
 „ 26,115 (1903). Hodgkinson. Impregnating wood and other porous materials to protect against damp, fungus, or insects, or for colouring. Oct. 5.

X.—METALLURGY.

- [A.] 20,159. Gillies. Apparatus to be used in the separation and recovery of sulphides from their ores.* Sept. 19.
 „ 20,160. Gillies. Apparatus for recovering zinc and other sulphides from their ores by the wet or chemical process.* Sept. 19.
 „ 20,300. Ogle, Sulman, and Picard. Treatment of ores, slimes, and the like. Sept. 20.
 „ 20,468. Duncan. Manufacture of steel.* Sept. 22.
 „ 20,542. Thompson (Wickels Metallpapier Werke). Substitute for tin foil, and process for making the same.* Sept. 23.
 „ 20,543. Armstrong. Furnaces or apparatus for obtaining zinc. Sept. 23.
 „ 20,656. Auchinachie. *See under XI.*
 „ 20,782. Bloxam (Soc. Anon. d'Études Electrochimiques). *See under XI.*
 „ 20,797. Fink-Huguenot. Process for the preparation of metallic oxides by direct combustion of the metal, and apparatus therefor. [Fr. Appl., April 19, 1904.]* Sept. 27.
 „ 20,842. Cruthwaite. Alloy. Sept. 28.
 „ 20,877. Goodwin and Hollidge. Magnetic separators. Sept. 28.
 „ 21,018. Bottomley and Paget. *See under IX.*
 „ 21,081. Dawes. Magnetic separators for ores, &c. Oct. 1.
 „ 21,088. Wilkins and Overend. Puddling and heating furnaces. Oct. 1.
 [C.S.] 14,398 (1903). Worsey and Hoal. Extraction of gold from gold ores. Oct. 5.
 „ 21,324 (1903). Dawes. Magnetic separators for ores, &c. Oct. 5.
 „ 23,333 (1903). Moss. Magnetic separators for ores or like materials. Sept. 28.
 „ 25,248 (1903). Rouse and Cohn. Method of converting powdered iron ore or iron waste or natural iron sands into briquettes or lumps. Sept. 28.
 „ 25,794 (1903). Hadfield. Manufacture of manganese steel. Oct. 5.
 „ 26,668 (1903). Meurer. *See under VII.*
 „ 9584 (1904). Routin and Mouraille. Metallic alloy. Sept. 28.
 „ 16,205 (1904). Edelmann and Wallin. *See under XI.*
 „ 17,038 (1904). Meadows. Preparing metallic mixtures. Sept. 28.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

- [A.] 20,285. Martin. Fireproofing electric cables. Sept. 20.
 „ 20,656. Auchinachie. Continuous electric furnace for reducing metallic oxides and other compounds. Sept. 26.
 „ 20,782. Bloxam (Soc. Anon. d'Études Electrochimiques). Electrolytic extraction of zinc from its ores, and apparatus therefor. Sept. 27.

- [A.] 20,809. British Thomson-Houston Co., Ltd. (General Electric Co.). Electric furnaces. Sept. 27.
 „ 20,810. British Thomson-Houston Co., Ltd. (General Electric Co.). Electric furnaces. Sept. 27.
 [C.S.] 14,809 (1903). Dintre and Nodet. Electric roasting oven. Sept. 28.
 „ 24,806 (1903). Hinz. Process for the electrolytic manufacture of peroxides of magnesium and zinc. Oct. 5.
 „ 25,433 (1903). British Thomson-Houston Co., Ltd. (General Electric Co.). Insulating material for electric conductors. Oct. 5.
 „ 44,87 (1904). Granier. Process and apparatus for the manufacture of sulphate of copper and caustic alkalis by the electrolysis of alkaline chlorides. Oct. 5.
 „ 12,188 (1904). Tourneur. Producing electric energy by the utilisation of the chemical energy of any suitable combustible without the employment of thermal engines. Sept. 28.
 „ 16,205 (1904). Edelmann and Wallin. Electric furnaces and the extraction of zinc by means of the same. Oct. 5.

XII.—FATTY OILS, FATS, WAXES, AND SOAP.

- [A.] 20,185. Ambleston. Apparatus for removing or extracting the oil or oily fibre from nuts, e.g., palm nuts. Sept. 19.
 „ 20,474. Boulton (Burton). Process of manufacturing hydroxystearic acid from oleic acid. Sept. 22.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, ETC.

(A).—PIGMENTS, PAINTS.

- [A.] 21,062. Bennett and Mastin. Manufacture of pigments. Oct. 1.

(C).—INDIA-RUBBER.

- [C.S.] 7795 (1904). Karavodine. Treatment and utilisation of waste vulcanised rubber and ebonite. Oct. 5.
 „ 17,818 (1904). Price. Process for the devulcanisation or regeneration of rubber waste. Oct. 5.

XIV.—TANNING, LEATHER, GLUE, SIZE, ETC.

- [C.S.] 17,979 (1904). Müller. Manufacture of imitation leather. Sept. 28.
 „ 18,185 (1904). Flek. Process and composition for treating leather. Oct. 5.

XVI.—SUGAR, STARCH, GUM, ETC.

- [A.] 20,166. Gonville and Jarvis. Caramelisation of carbohydrates. Sept. 19.
 [C.S.] 15,297 (1904). Drewsen. Process of manufacturing products from cornstalks, sugar-cane, and analogous pithy stalks. Oct. 5.

XVII.—BREWING, WINES, SPIRITS, ETC.

- [A.] 20,584. Nathan. Brewing beer. [German Appl., Oct. 7, 1903.]* Sept. 23.
 [C.S.] 26,360 (1903). Tuckfield and Garland. Process of recovering alcohol and other volatile matters from waste or other products. Sept. 28.

XVIII.—FOODS; SANITATION, WATER PURIFICATION; & DISINFECTANTS.

(A).—FOODS.

- [A.] 20,273. Bromhead (Chem. Fabr. Helfenberg). See under XX.

- [A.] 20,291. Kennedy. Treatment of milk.* Sept. 20.
 „ 20,292. Taylor. Cream substitute.* Sept. 20.
 „ 20,339. Hamaker. Milk food and method of manufacture. Sept. 21.
 „ 20,340. Hamaker. Milk food and method of manufacture. Sept. 21.
 „ 20,658. Bernstein. Utilisation of the protein substances of milk. Sept. 26.
 „ 20,885. Combret. Alimentary products constituting a phosphated vinegar. [Appl. in Belgium, Sept. 28, 1903.]* Sept. 28.
 [C.S.] 17,431 (1904). Grenard. Preserving compound for the conservation of eggs and other alimentary substances. Oct. 5.

(B).—SANITATION; WATER PURIFICATION.

- [A.] 20,889. Kremer and Schilling. Method of and apparatus for the bacterial purification of sewage and the like.* Sept. 28.
 „ 20,984. Pearson. Apparatus for producing pure water by distillation, automatic and continuous in operation. Sept. 30.
 „ 21,059. Noake. Method of aerating or oxygenating sewage. Oct. 1.
 [C.S.] 28,137 (1903). Bonnotte. Manufacture of a compound for preventing scale in steam boilers. Sept. 28.

(C).—DISINFECTANTS.

- [A.] 21,053. Morgan. Method and process of disinfecting.* Sept. 30.

XIX.—PAPER, PASTEBOARD, ETC.

- [A.] 21,101. Birkbeck (Brooks). Process for making a substitute for cork. Oct. 1.
 [C.S.] 18,117 (1904). Bradley. Paper-making machines. Sept. 28.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

- [A.] 20,195. Imray (Meister, Lucius und Brüning). Manufacture of iodine compounds. Sept. 19.
 „ 20,278. Bromhead (Chem. Fabr. Helfenberg, Ltd., formerly Eugen Dieterich). Process for producing a stable non-alcoholic solution of iron-peptone or iron-manganese-peptone.* Sept. 20.
 „ 21,047. Darzens. Manufacture of certain aldehydes and intermediate products. [Fr. Appl., Nov. 28, 1903.]* Sept. 30.
 [C.S.] 22,163 (1903). Zimmermann (Chem. Fabr. auf Actien, vorm. E. Schering). Manufacture of acidyl derivatives of rufigalic acid alkyl ethers. Sept. 28.
 „ 26,460 (1903). Imray (Meister, Lucius und Brüning). Manufacture of pyrocatechol derivatives. Oct. 5.
 „ 15,784 (1904). Boulton (F. Fritzsche und Co.). Manufacture of protocatechuic aldehyde. Oct. 5.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

- [A.] 20,157. Bonnaud. Paper and other surfaces for photographic printing. Sept. 19.
 „ 20,272. Shepherd. Colour sensitometers. Sept. 20.

XXII.—EXPLOSIVES, MATCHES, ETC.

- [A.] 20,251. Nicolay. Match.* Sept. 20.
 „ 20,284. Hope. Explosives. Sept. 20.
 [C.S.] 24,511 (1903). Yonck. Explosives. Oct. 5.

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 Weightman, Aubrey H., 1915, Walnut Street, Philadelphia, Pa., U.S.A., Chemical Manufacturer.
 Wherry, H. P., c/o Boston and Montana Smelter, Great Falls, Mont., U.S.A., Chemical Engineer.
 Wild, Irving L., 235, College Street, Middletown, Conn., U.S.A., Electrical Engineer.
 Wright, Chas. L., Electric Illuminating Co., Cleveland, Ohio, U.S.A., Chemical Engineer.

Changes of Address.

When notifying new addresses, members are requested to write them distinctly, and state whether they are temporary or permanent. Multiplication of addresses is also to be avoided as tending to create confusion. When sending subscriptions, the use of the form attached to the application helps in the verification of addresses, on which the safe delivery of the Journal depends.

- Aykroyd, H. E., 1/o Ilkley; Ashdown, Apperley Bridge, near Bradford, Yorks.
 Baty, Ernest J., 1/o Birkenhead; Nunclose, Prince's Avenue, West Kirby, Cheshire; and (Journals) c/o The Dee Oil Co., Saltney, near Chester.

- Bennie, P. McN.: Journals to Fitzgerald and Bennie Laboratories, P.O. Box 118, Niagara Falls, N.Y., U.S.A.
- Bolam, Dr. H. W., 1/o Leith Technical College; 2, Summerfield, Leith, N.B.
- Cameron, Alex., 1/o Lexham Gardens; Whitcher Place, Rochester Road, Camden Road, N.W.
- Caspari, Dr. W. A., 1/o Langham Road; 28, Colleshill Road, Teddington.
- Clayton, Dr. G. Christopher, 1/o Maldon Lodge; Etonfield, Wavertree, Liverpool.
- Cleveland Chemical Society; Journals to c/o Prof. C. F. Mabery, Case School of Applied Science, Cleveland, Ohio, U.S.A.
- Connor, Chas. C.; all communications to 4, Queen's Elms, Belfast, Ireland.
- Cronquist, G. W., 1/o Sweden; Rhenania Chamotte und Dinas Firebrick Co. Ltd., Bendorf a/Rhein, Germany.
- De Wilde, Prof. P.; Journals to Hotel d'Orient, Bône, Algeria.
- Evershed, F.; all communications to Kenley, Surrey.
- Fitzgerald, F. A. J.; Journals to Fitzgerald and Bennie Laboratories, P.O. Box 118, Niagara Falls, N.Y., U.S.A.
- Hodgkins, D. H., 1/o Newark; 82, Lafayette Avenue, Passaic, N.J., U.S.A.
- Lessing, Dr. R., 1/o Brunswick Square; c/o Gas Light and Coke Co., Tar Works, Beckton, E.
- McCowan, Wm., 1/o Neilston; Essex Wharf, Narrow Street, Limehouse, E.
- Mond, Robt. L.; Journals (temporarily) to c/o Thos. Cook and Son, Cairo, Egypt.
- Munroe, Prof. Charles E., 1/o Columbian University; George Washington University, Washington, D.C., U.S.A.
- Neilson, Thos., 1/o Mexico; Highland Bay Smelter, Murray, Utah, U.S.A.
- O'Brien, Claude H.; all communications to Tamunua, Navua, *via* Suva, Fiji.
- Oglesby, W. R.; Journals to c/o Alma Cement Co., Wellston, Ohio, U.S.A.
- Olshausen, B. A., 1/o New York; 1505, St. Andrew's Place, Los Angeles, Cal., U.S.A.
- Parker, Chas. E., 1/o New Street; 151, College Avenue, New Brunswick, N.J., U.S.A.
- Pizoy, J. H., 1/o Muswell Hill; Anchor Chemical Works, Provanmill, Glasgow.
- Rawson, Christopher, 1/o New York; 44, St. Augustine's Road, Bedford.
- Roseow, J. F., 1/o Norwich, Conn.; P.O. Box 417, Boonton, N.J., U.S.A.
- Tilley, Jas. W., 1/o Brixton Hill; 95A, Southwark Street, London, S.E.
- Vernon, R. H., 1/o Lausanne; Cornell University, Ithaca, N.Y., U.S.A.
- Wingate, Hamilton M., 1/o Wynell Road; 90, Queenswood Road, Forest Hill, S.E.

MEMBER OMITTED FROM LIST.

O.M. Kearns, H. W., Bazenden House, near Accrington, Dyer.

CHANGE OF STYLE.

His Majesty the King has been pleased to confer the honour of Knighthood on Mr. Thos. Stevenson, M.D., Guy's Hospital, S.E.

Deaths.

- Chattaway, Wm., Apothecaries' Hall, London, E.C. Oct. 7.
- Pattinson, Dr. H. S., Newcastle-on-Tyne. Oct. 26.
- Storar, John, of Reckitt and Sons, Ltd., at Coniston Lodge, Horneea. Oct. 6.

Annual General Meeting,

NEW YORK, 1904.

The following is an outline of the proceedings of the Annual General Meeting and the excursions connected therewith. It is impossible to give adequate expression here to the deep debt of gratitude which the visitors owe to those fellow members and ladies, not only in New York, but in all the other cities visited, who devoted themselves so unsparringly in order to uphold the traditions of American hospitality and make a record meeting.

It is hoped to publish detailed reports of visits to works and other places of interest as they come to hand. For this the Council will be to some extent dependent on the further courtesy of those manufacturers and others who have already laid the Society under so deep an obligation.

NEW YORK.

The following is a list of the committees charged with the various arrangements for the New York meeting and for providing the facilities of travel in connection with the visits to various other cities included in the programme of entertainment:—

BRITISH COMMITTEE.

The President.

E. Divers.	F. B. Power.
R. W. Greeff.	Boverton Redwood.
Samuel Hall.	W. S. Squire.
H. Hemingway.	Thos. Tyrer.
B. E. R. Newlands.	T. J. Wrampelmeier.

NEW YORK COMMITTEES.

Executive Committee.

H. Schweitzer, Chairman.
T. J. Parker, Secretary.
R. C. Woodcock, Treasurer.

Virgil Coblentz. | E. G. Love.

Finance Committee.

W. H. Nichols, Chairman.

Chas. F. Chandler.	T. J. Parker.
H. A. Metz.	R. C. Woodcock.

Hotel and Transportation Committee.

C. B. Zabriskie, Chairman.

Leo Baekeland.	Wm. F. Hoffmann.
De Laguel Haigh.	Clifford Richardson.

Entertainment and Programme Committee.

E. G. Love, Chairman.

Leo Baekeland.	A. P. Hallock.
Marston T. Bogert.	G. C. Stone.
Gustav Drobegg.	Maximilian Toch.

Invitation and Press Committee.

E. J. Lederle, Chairman.

W. F. Fuerst.	R. C. Schuepphaus.
R. W. Moore.	H. W. Wiley.
Wm. J. Schieffelin.	D. Woodman.

Reception Committee.

Virgil Coblentz, Chairman.

A. C. Bedford.	E. J. Lederle.
F. J. Butterworth.	William McMurtrie.
W. B. Cogswell.	Wm. H. Nichols.
Thomas A. Edison.	Chas. Pellew.
William H. Erhart.	Wm. J. Schieffelin.
H. C. Grant.	F. Schniewind.
Edward Hart.	F. M. Smith.
J. Hasslacher.	I. F. Stone.
A. C. Humphreys.	F. G. Zinsser.

Ladies' Committee.

Mrs. Charles E. Pellew, Chairman.

Mrs. Leo Baekeland.	Miss Parker.
Mrs. Marston T. Bogert.	Mrs. Thomas J. Parker.
Mrs. Virgil Coblentz.	Mrs. Clifford Richardson.
Mrs. Ernest J. Lederle.	Mrs. Wm. J. Schieffelin.
Mrs. Herman A. Metz.	Mrs. Hugo Schweitzer.
Mrs. William McMurtrie.	Mrs. Maximilian Toch.
Mrs. Wm. H. Nichols.	Mrs. Fred. G. Zinsser.

The names given above by no means exhaust the list of those who co-operated in receiving and entertaining the visitors. The Hotel and Transportation Committee made themselves responsible for the whole of the railway trip, for hotel accommodation in all cities visited, and for transport of baggage, while the work entailed upon the Executive and Finance Committees still engages their attention. Subcommittees of the Reception Committee met the various steamers on arrival, and saw the visitors safely lodged in the Hotel Seville, Madison Avenue and 29th Street, the Society's headquarters, where their comfort was looked after by Mr. L. Raegener, a member of the Society who is part owner of the hotel.

WEDNESDAY, SEPTEMBER 7TH.

The programme began with a reception at the Chemists' Club, 108, West 55th Street, at 9 p.m., at which some 350 guests were present, including many of the foremost scientists of Europe, who were passing through New York on their way to the Congress of Arts and Sciences at St. Louis.

THURSDAY, SEPTEMBER 8TH.

After a council meeting at Havenmeyer Hall, the general meeting of the Society was held in the Gymnasium of Columbia University, 116th Street, Amsterdam Avenue (this J., Oct. 15, 1904, 924—926). Among those present were the President and President-elect, Prof. C. F. Chandler (Chairman of the New York Section), Dr. H. Schweitzer (Chairman of the Executive Committee and Hon. Sec. of the New York Section), Mr. T. J. Parker (Secretary of the Reception Committee), President Remsen (Johns Hopkins University), Prof. Hart (Lafayette College), Dr. Russell W. Moore (U.S. Customs), Judge Waite, Dr. L. Baekeland, Dr. Charles Baskerville (College of the City of New York), Prof. M. T. Bogert (Columbia University), Prof. W. H. Chandler, Prof. V. Coblentz (College of Pharmacy), President Humphreys (Stevens Institute of Technology), Dr. E. G. Love, Dr. Wm. McMurtrie (American Chemical Society), Dr. W. J. Schieffelin (Chairman, New York Section of American Chemical Society), Dr. H. W. Wiley (U.S. Department of Agriculture), Mr. R. C. Woodcock, Prof. T. M. Drown (President, Lehigh University), Dr. Eames, President Finley (College of the City of New York), Prof. Dr. H. Erdmann (Berlin), Prof. Dr. Oscar Liebreich (Berlin), Prof. Möhlau (Dresden), Prof. Ostwald (Leipsic), Mr. Thos. Tyrer (past President of the Society), Dr. F. B. Power, Dr. K. Messel, Mr. Max Muspratt (Vice-Presidents), Dr. J. Lewkowitsch (Member of Council), and Mr. Eustace Carey (Chairman of Liverpool Section).

Photographs were taken of the Council and also of Members in front of the Library of Columbia University; copies of these may be obtained from Harry Coutant, 18, Alice Court, Brooklyn, N.Y. (see notice, p. 963).

Luncheon was provided in the open piazzas of Claremont, an old residence near the University and Grant's Tomb, overlooking the Hudson. Thence 24 automobiles took the party for a drive through the upper part of the city, and by Riverside Drive and through Central Park to the Hotel Seville.

At 7.30 p.m. the visitors were entertained at dinner by the New York Section at the Waldorf-Astoria Hotel, Fifth Avenue and 34th Street (see J., Oct. 15, 1904, 926—927). Covers were laid for 270. On the dais, besides the President and President-elect, were Prof. C. F. Chandler (Toaster), President Ira Remsen, Profs. Ostwald, Liebreich, and Möhlau, Drs. Hallock, Wiley, and Schweitzer, Mr. Thos. Tyrer, President Finley, and Mr. Clive-Bayley, British Vice-Consul.

The menu was executed by Tiffany. The cover, in chromo-collotype, showed at the top a sketch of the port of New York and the arrival of a steamer, in the middle were the two hemispheres united by the scroll of the Society of Chemical Industry, and at the bottom the power station and Falls of Niagara. For each guest there was a gilt three-handled loving-cup, a white chrysanthemum, and a leaf of laurel.

Meanwhile the Ladies' Committee entertained the ladies at a theatre-party, which was followed by a supper at the Waldorf-Astoria Hotel.

By the courtesy of various members of the New York Section, many visitors were made honorary members of the University Club and other important New York clubs.

FRIDAY, SEPTEMBER 9TH.

Excursion 1.

Guide: Mr. T. J. PARKER.

Nichols Chemical Co.'s Copper Refinery at Laurel Hill.

Through the courtesy of this Company the steamer *Quaker City* took the party to the works, after inspecting which they were entertained at luncheon by the officials of the Company. Both ladies and gentlemen took part in this excursion.

Mr. WM. H. NICHOLS, in welcoming the visitors, gave a short account of the growth of the works. Years ago, he said, the enormous works over which they had been conducted consisted of a small plant worked by two men, of which he himself was one. Now the premises covered many acres of ground. The copper refinery was nearly twice as large as any other works of its kind in the world, and the amount of copper produced at Laurel Hill was over one-fifth of the total production of the world. He could not lay claim to the scientific knowledge possessed by many of those present, but he attributed his success and the success of the works to his knowledge of men, and hence to the men whom he had drawn around him to assist him. One of the first of these had been Mr. Herreshoff, and he would add that these works were the first in the State of New York in which a chemist had been employed. He then called upon Mr. Herreshoff to address the company.

Mr. HERRESHOFF said that in large works the usual plan was to cast the copper into plates, as had been shown. The impure copper contained gold and silver, for the complete removal and recovery of which the electrolytic method was employed. In addition to gold and silver, other metals that were never removed before by the ordinary firing methods—namely, arsenic, tellurium, selenium, and antimony, &c., which make copper very brittle—were also thus removed. The copper thus produced was of 99 per cent. purity. The success of the electrolytic process had caused a great many mines to be opened which could never have been worked otherwise. Their method was the well-known series system. True, the multiple system was more generally used, but it was curious that the largest works in the world employed a method that was generally condemned. In their method there were serious difficulties to be overcome, but certainly they had overcome them.

In regard to the other parts of the plant, the reverberatory furnaces were very simple. The Bessemer converter had been first introduced 18 to 20 years ago in France, and was now used largely in the West in large copper plants. The molten matte, as it came from the smelting furnaces, was run into bowls and air blown in to oxidise the sulphur. The matte consisted of 55 per cent. of copper, 20 per cent. of sulphur, and 25 per cent. of iron. The iron was very easily oxidised, but silica had to be supplied. In the application of silica many difficulties were encountered. They confined themselves to the use of a brick lining, consisting largely of silica, 85 per cent. or more. The thickness of the bricks was about 18 ins. The revolving liquid inside caused a rapid combination of the oxygen and iron. In 15 minutes the contents of a converter, fed with 4 tons of matte, was oxidised, the residue taken out, and the copper left. The point at which this was to be done was determined by the little scintillations thrown out—a phenomenon requiring a practised eye to observe. 90 per cent. copper was poured out. The process was an intermittent one, each operation taking one hour and a half or two hours. When the lining was reduced to about one-half of its original thickness, it was removed by what was known as a lapp machine, something like a rock drill, and made up with fresh material.

Excursion 2.

Guide: Mr. GEORGE C. STONE.

The members of the party visited the Spiegel Furnace of the New Jersey Zinc Co., the works of the Balbach Smelting and Refining Co., and of the Murphy Varnish Co. at Newark.

In the evening there was a Reception at the Majestic Hotel, in Central Park West, the weather proving too wet for the party to avail themselves of the Roof Garden, which is a feature of this hotel.

SATURDAY, SEPTEMBER 10TH.

Excursion 3.

Guide : Mr. GEORGE F. KUNZ.

Most of the ladies and many of the gentlemen visited the establishment of Messrs. Tiffany and Co., Union Square, where jewels, jewel cutting, and setting were shown. Statuary, bronzes, porcelain, and glass, in which the highest forms of art are exhibited, are also a feature of this establishment. Here too was seen "Kunzite," a new lilac-coloured spodumene from Pala, California, so called in honour of the Director, who, together with Dr. Chas. Baskerville, has devoted considerable study thereto. The mineral affords, when cut, a new gem of great beauty.

Others visited the Metropolitan Museum of Art, Fifth Avenue and 82nd Street. Among the principal modern pictures of a collection still further enriched by the loan collection of W. H. Vanderbilt, may be mentioned Turner's "Grand Canal at Venice," Meissonier's "Friedland," Millet's "Sowers," Rosa Bonheur's "Horse Fair" (that in the National Gallery is a small replica), Leighton's "Lachrymæ," and a "Holy Family," by Knäuss—considered to be equal to the best work of Murillo.

The Cesnola Collection of Cyprian Antiquities, the Bishop Collection of Jade, and the Morgan Collection of Porcelain are the finest of their respective classes in the world.

After luncheon at the Casino, Central Park, the members drove to the American Museum of Natural History, Eighth Avenue and 77th Street, and inspected the paleontological collection, which includes the celebrated series of fossil horses collected by Prof. Marsh, and regarded as conclusive evidence of the truth of the theory of evolution; the paleontological collection of the late Prof. J. Hall; the gem room; and the Bement Collection of minerals.

Excursion 4.

Guides : Dr. A. H. ELLIOTT and Mr. M. TOCH.

The works of the New York Edison Co.; Westinghouse, Church, Kerr, and Co.'s power house for the Pennsylvania Railroad at Long Island City; and the Ravenswood works of the Consolidated Gas Co., were visited. Luncheon was served by invitation of the Consolidated Gas Co.

Excursion 5.

Section A.—Guide : Dr. M. WALLERSTEIN.

A party of gentlemen visited the brewery of George Ehret, lunching afterwards with Section C.

Section B.—Guide : Dr. WM. McMURTRIE.

Another party visited the works of the Tartar Chemical Co., Brooklyn, and later joined Section C. at lunch.

Section C.—Guide : Dr. A. P. HALLOCK.

A third party, consisting both of ladies and gentlemen, visited the mineral water factory of Carl H. Schultz, 440, First Avenue, and, with Sections A. and B., were entertained at a sumptuous lunch by invitation of the company.

It should here be mentioned that Mr. Carl H. Schultz also gave to the Society a very ample supply of mineral waters, wines, and spirits for the use of the special train in which the party afterwards travelled.

The paint works of the F. W. Devoe and C. T. Reynolds Co., and John W. Masury and Sons, Brooklyn, were also open to members.

Excursion 6.

Guides : Mr. GEORGE C. STONE and Mr. E. L. RANSOM.

A party of gentlemen visited the works of the Pacific Coast Borax Co. and Tide Water Oil Co. at Bayonne, N.J.

By the courtesy of Mr. W. J. Matheson, who placed his steam yacht *Lavrock* at their disposal, a small party of members, including the President and President-elect, were enabled to wait upon the President of the United States at his marine villa at Sagamore Hill, Oyster Bay. President Roosevelt expressed his great regret at being unable to receive the Society at the White House, owing to his absence, for a much needed rest, from Washington at the time of the Society's visit to that city. He offered them a most cordial welcome to the United States.

On Saturday evening a smoking concert and Vaudeville entertainment was offered to the members at the "Liederkrantz," a German Club, whose object is indicated by its name. Members found on the tables copies of "A. No. 1, Vol. II," of "The Journal of the Society of Chemical Industry," issued that day by an irresponsible Publication Committee in New York. The "Table of Attempts" included "Council Notices," "Changes of Address," "New Members Elected," "A Few New Elements" by "Ch. Hounderville," and other original papers and songs. It is hoped to obtain some further copies for home members. After supper an illuminated address was presented by Sir Wm. Ramsay to the New York Section on behalf of the European visiting members, in order to place on record their feelings of gratitude and esteem for the magnificent reception accorded to them. Credit is due to Mr. David Perry for the expedition with which the address was prepared, in view of the very limited time that was available for this purpose.

SUNDAY, SEPTEMBER 11TH.

The New York portion of the Annual Meeting concluded on Sunday with a steamer trip up the classic Hudson River as far as West Point. Near the city the river presents, on either hand, a varied scene of docks and shipping, while further to the north the Palisades, rising on the western shore, form a beautiful contrast to the more gentle slopes of the eastern. Scarcely a mile is passed that does not remind the student of much of interest in American history. The Palisades attain their greatest height of 550 feet directly opposite Hastings. West Point, the highest point reached, is the home of the United States Military Academy.

During the trip Mr. Thos. Tyrer, on behalf of the lady visitors, presented a silver vase to Mrs. Charles E. Pellew, Chairman of the Ladies' Committee, wife of the Adjunct Professor of Chemistry at Columbia University, and daughter of Prof. C. F. Chandler. Beautiful weather favoured this trip, the haze of early morning soon giving way to bright sunshine, in which the, scarlet tint of the maples, those harbingers of autumn, only served to set off the brilliant green of the foliage which clothed the banks on either side.

MONDAY, SEPTEMBER 12TH.

At 8 a.m. the whole party left New York by the West 28rd Street Ferry for the special train by the Pennsylvania Railroad to Philadelphia.

The following American and Canadian members accompanied the party:—Dr. L. Baekeland, New York; Prof. M. T. Bogert, New York; Mr. H. J. Case, New York (special correspondent of the Central Press); Mr. W. Dreyfus, New York; Mr. M. L. Hersey, Montreal; Mr. W. Hochstetter, Cincinnati; Mr. Theo. Körner, New York; Mr. H. J. Krebs, Wilmington, Del.; Dr. E. G. Love, New York; Mr. A. P. Van Gelder, Emporium, Pa.; and Mr. C. B. Zabriskie, New York.

The President-elect, Mr. Wm. H. Nichols, was prevented from joining the party by the sudden illness of Mrs. Nichols, and Mr. T. J. Parker was also detained by illness. Both, however, joined later.

The following representatives of the Pennsylvania Railroad were also in attendance:—Mr. H. C. Bates, Tourist Agent; Mr. T. S. Wilson, Special Baggage Master; and Mr. N. W. Hower, Stenographer, with a full staff, including some 30 car attendants, &c.

(To be continued.)

New York Section.

Meeting held at Chemists' Club, on March 25th, 1904.

DR. VIRGIL COBLENTZ IN THE CHAIR.

THE PREPARATION OF COTTON FIBRE FOR SURGICAL PURPOSES.

BY FRED B. KILMER.

The use of cotton fibre in surgery as an application to wounds is of comparatively recent origin. Cotton cloth in strips has long been employed as an outer or retaining bandage. Lint was, until quite recently, made, as its name implies, of flax. About 1837, loose cotton was suggested for the direct covering of wounds, but was not generally adopted. In 1864, Augustus Touraine, a surgeon-major in the army of Maximilian, published a formula and process for the preparation of "Hydrophile" cotton.

The real introduction of absorbent cotton into surgery is due to Lister, who propounded the doctrine that both wound treatment and dressing should prevent the access of micro-organisms, and that when micro-organisms have entered in spite of every care, they should be destroyed or rendered incapable of harm. The Lister system, as first practised, called for the use of cotton and gauze dressings impregnated with antiseptics. The first of these dressings used was non-absorbent, but very early cotton fibre and gauze were demanded which would absorb wound discharges and antiseptic solutions.

Absorbent cotton fibre, under the name of "Absorbent Cotton," became an article of commerce about 1877. Now wherever surgery is practised cotton fibre in some form is the basis of every form of dressing. The industry is noted for its rapid growth. Twenty years ago there was no maker who could produce as much as one hundred pounds at one time, and even the largest purveyors rarely handled more than that amount in a year. The wholesale price of absorbent cotton in 1881 was 1.12 dols. per pound for pound packages; in smaller packages, 2.25 dols. per pound. At the present time the wholesale price ranges from eighteen cents for the lower grades to thirty cents per pound for the higher types.

There are single retail dealers at the present time who handle 40,000 lb. of absorbent cotton in a year. One of the laboratories in the United States, where this article is produced, has in process upwards of 20,000 lb. at one time. The table which follows is an estimate made by one of the largest manufacturers:—

Cotton used in Surgery in the United States.

	1878.	1886.	1893.
Raw cotton	1,000	5,000	20,000
Absorbent cotton ..	5,000	250,000	3,000,000
Bandages	10,000	20,000	10,000
Gauze	1,200	120,000	20,000,000
Lint	50,000	45,000	40,000
Miscellaneous dress- ings	500	2,000	20,000

The present output of cotton for surgical purposes is upwards of 6,000,000 lb. per year, and there is invested in this industry a capital aggregating five millions of dollars. There is also an increasing demand for this class of material in various industries. The increased demand has reduced the cost while the products have also greatly improved. As to surgical cotton, the best produced as recently as 15 years ago was yellow, dirty, and not absorbent. It was packed in wads and put up in all sorts of boxes and paper wrappings.

The improvement introduced about 1887 by an American maker, whereby the absorptive power and the whiteness was increased, and the cotton put up in continuous sheets with

layers of tissue paper between, had a pronounced effect upon the consumption.

Absorbent cotton carefully made from clean straight fibre, of the type known as Texas Strict Middlings, is elastic and springy, and will absorb about fifteen times its weight of water. The moisture is quickly diffused through the whole of the fibre. It does not pack and lie hard on the flesh, but stands up, forming an absorbent cushion. Cotton made of a low grade fibre, or from mill waste or old rags lacks absorbing and diffusing power and when wet packs down like so much clay.

Selection of Fibre.—In the preparation of cotton for surgical uses, the selection of the raw cotton, the grade, and the staple are not the only factors to be considered. The high class fibres represented in the Sea Island and Egyptian types, which are long stapled and small in diameter are unsuitable, since they would produce a thread too fine for surgical gauze, and could be made absorbent only with difficulty. The Egyptian and Brazilian types are rough and woolly; the brown varieties of these types can scarcely be made white in the processes which are employed. The East Indian fibres are rarely used, for the reason that those which are low in price are short, harsh, brittle, weak in staple, and often very badly stained, and mixed with leaves and dirt. The most desirable kinds are those represented by the American types known as Orleans, Texas, Allenseed, Mobile, and Benders.

The grade known as strict middlings gives the best results. To make a good product, the fibre must be free from seed, leaf, sand, and mud, which even under the most careful treatment will appear in the finished product, and cannot be made absorbent. Stained, tinged, or off-coloured fibre will never become white, and absolute whiteness is of prime importance.

In every pod of cotton, when the plant reaches maturity, there remains an under-growth of short hairs at the base of the seed. If the ginning process is run very closely, these hairs are removed, and mixed with the longer fibre. They are not perfect fibres, and never become fully absorbent or white, and have a great tendency to form what are known as nibs or nebs. Again, unripe or immature fibres have to be reckoned with. They are extremely thin and transparent, with little or no twist. When spun into yarn they contract and tie themselves into knots. These unripe fibres contain no cellular opening, do not form capillary tubes, and do not become absorbent. Under the action of chemical agents they have a tendency to become brittle. In the carding operations such fibres become entangled with the perfect fibres, and prevent the formation of a smooth web.

In spinning mills, where the better grades of woven cloths are produced, all nebs, unripe, immature, and short fibres are removed in the carding and combing processes. The carded, or combed-out product, known as "card waste," "combers' waste," "linters' waste," "fly waste," &c., is consumed in the manufacture of low-priced surgical cotton. The higher grades can only be produced from cotton fibres of a good grade and staple.

The process now generally followed for rendering cotton fibres absorbent is that originally devised by Slocum and modified by the writer. At a first glance, the chemical processes involved will appear quite like the familiar bleaching methods, but there are essential points of difference.

Cotton fibre can be bleached without being rendered absorbent, and it can also be made absorbent without being bleached. On the Continent, cotton fibre and woven gauze are made absorbent and prepared for surgical use by simple extraction of the fatty matters with solvents such as petroleum ether, carbon bisulphide, or by an alkaline treatment without bleaching. The resulting product is fairly absorbent, but is not white.

Bleached cotton cloth and fibres which are not absorbent are well-known products. No bleacher in the trade would dare subject his fibre to the very drastic treatment used in the processes here outlined.

The principal operations in the preparation of cotton fibre for surgical uses, in the form of absorbent cotton and surgical gauze, may be summarised as follows:—

I. Mechanical Operations.—(1) Sampling and inspection to establish grade. (2) Mixing. The blending of different varieties of raw cotton to ensure uniform quality and colour, and an even fleece or thread. (3) Opening. In this process the matted masses of cotton fibre are opened out and shell, sand, leaf, &c., are removed. (4) Beating, blowing, lapping, or "scutching" (a continuation of the process of opening). At the end of this the cotton is rolled in an even sheet or lap. (5) Carding. In this process the fibres are further opened out and individually separated; very fine impurities are removed, together with short and unripe fibres. As the cotton leaves the card, the fibres, if they are to be made into absorbent cotton, are gathered together in a web or fleece; if they are to be made into surgical gauze they are gathered into a rope a little less than an inch in diameter, called a "sliver."

II. Chemical Processes.—(1) The cotton fibre (mechanically cleaned) is packed in boilers and washed with water. (2) Alkaline hydrolysis. In this process the non-cellulose constituents of the fibre, wax, fatty oils, pectose, &c., are hydrolysed. (3) Extraction of alkali and hydrolysed products. (4) Acid oxidation. The removal of colouring matter, residues, and by-products of the alkaline treatment (the first stage of bleaching). (5) Hydro-extraction of oxidising chemicals. (6) Acid oxidation. A continuation of the oxidation and bleaching action. (7) Hydro-extraction of acids and acid products. (8) Second alkaline hydrolysis. (9) Hydro-extraction of alkaline products. (10) Second acid oxidation (completion of bleaching). (11) Neutralisation of chemicals and removal of neutralisation salts. (12) Hydro-extraction.

III. Mechanical Processes.—(1) Opening. The fibre at this point is bleached and absorbent, but somewhat matted and tangled, and must be opened for subsequent operations. (2) Drying (at 220° F.). (3) Lapping. Gathering into sheets preparatory to carding. (4) Carding. The fibres are individually separated and formed into thin films and the films gathered into layers. (5) Rolling in layers with thin tissue paper between each layer. The rolls are cut into sizes, pound, half-pound, quarter-pound, ounce, &c., and packed into cartons or rolled into packages. (6) Sterilisation.

The mixing or blending process is important, whether the final product is to be absorbent cotton or surgical gauze. Short and defective fibres, if present, must have a proper proportion of perfect fibres to make a suitable web or thread. When cotton waste is employed, the mixing or blending operation becomes a fine art.

The operations of opening, beating, blowing, scutching, likewise require considerable skill.

In the final product no dyes nor fillers can be used to aid in covering up unsightly particles. Every speck, seed, leaf, &c., must, if possible, be removed. If these specks are light in gravity, their removal is practically impossible.

The fibres must be well opened out. There must be no tangled masses or the cotton will not be acted upon by the chemical agents used in the subsequent operations. Fibres to be used for absorbent cotton are best left in their natural curl or twist, in as even sheets as possible, lying crosswise on each other in such a way as best to be receptive of the hydrolysing solutions. On the contrary, fibres to be used in gauze are laid parallel to each other and then twisted together.

After the mechanical treatment outlined in the table the sheeted fibres (laps) are packed in vats or kiers for the chemical treatment. This is shown in the table as taking place in twelve stages. These are sometimes carried out in one vat by passing the fibre through; but more often, after the first alkaline treatment, the fibres are removed to an open vat, washed, and then passed through to subsequent processes in crates or in bunches moved by hand. Washing machines of the rake type, such as are used in wool scouring, are also utilised.

In packing into kiers, when a considerable percentage of short fibres is present, the fibres have a tendency to become so closely pressed that the solutions do not readily penetrate. With regular fibres, this packing is avoided by the natural elasticity of the hairs, and their tendency to

spring up and allow a free movement of the extracting liquids.

The essential feature of rendering the fibres absorbent is embraced in the stage designated in the table as number 2, or alkaline hydrolysis. This consists of boiling the fibres in a solution of caustic soda of about 1 per cent. strength. This is varied with the condition of the fibre, its colour, tenacity, &c., of which the operator must judge in each individual case. The boiling is conducted under low pressure, continuing from 12 to 48 hours. Extraction under a vacuum has been tried, but found to be of no advantage. In fact, in experiments noted by the writer, the fibre was not wholly absorbent when boiled in a vacuum.

In the alkaline treatment a portion of the cellulose is dissolved. Upon this point I have made the following experiments:—Carded and cleaned cotton fibre were dried to constant weight, boiled in solutions of caustic soda of varying strength for different periods, washed until free from alkaline reaction, and again dried to constant weight. The losses are shown in the following table:—

Loss of Weight of Cotton Fibre by Boiling in Caustic Soda Solution.

Strength of Solution.	Loss on Boiling for	
	Half Hour.	One Hour.
Per Cent. 1 2½	Per Cent. 4.41 5.09	Per Cent. 5.71 7.33

The products of the alkaline treatment are not easily removed from the fibre, especially in the mass. In ordinary bleaching processes the fibres become white in the process which follows the first, or alkaline, treatment. The washing away of the saponified products is a long operation, and at the end of it the fibre structure is not freed of its contents. Their final removal takes place subsequently.

The first alkaline treatment is followed by the bleaching proper. Here the fibres are subjected to the prolonged action of a solution of hypochlorite containing, approximately, 0.1 per cent. of chlorine. The hypochlorites of lime and soda have both been used. The former is employed almost exclusively in the cheaper grades of cotton and gauze. The soda bleach produces a softer, whiter, and more elastic product. The Thompson process, viz., utilising the combined action of hypochlorite and carbon dioxide has been tried, but has been found too expensive and difficult to manage with large masses of loose fibre. Sodium peroxide has also been tried experimentally, but the present price was found to be prohibitive.

In practice, the oxidation is carried to the utmost limit that the fibre will allow. The requirement is not only to attack the colour, but to penetrate every molecule and to break every existing combination, even those remaining from the alkaline hydrolysis. The way is thus prepared for the removal in the subsequent operations of everything except the cellulose.

It can easily be imagined that in the process here described the cellulose itself is attacked and oxidised. That the cellulose is oxidised is shown by the great rapidity with which these fibres take up basic coal-tar dyes. In fact, the affinity of the fibres for these colours is, in a rough way, a measure of their absorbency. The fibre is always more or less tender and gives the usual reaction for oxy-cellulose.

The residues of hypochlorite solution are next washed away, as shown in the table under No. 6, and the fibre subjected to acid oxidation, in a solution of either sulphuric acid (2 per cent.) or hydrochloric acid (1 per cent.). The oxidation and bleaching is carried one point further. In practice, the process is pushed to a partial solution of the inorganic constituents of the fibre. The acid being carefully washed out, there follows a second alkaline treatment, No. 7 in the table of operations. The object of this process is to attack any matter not reached in the first alkaline treatment; to remove fatty matters decomposed in the chemical

process, and to render soluble any residue still remaining in the fibre.

The strength of the alkali is generally about 0.25 per cent. of NaOH, and the time of boiling is short. After washing away the alkali, a second acid treatment follows. Any residue soluble in acids is removed, inorganic salts are dissolved, iron compounds and stains are cleared, and the cotton assumes a full white.

The next step is of considerable importance. It is difficult to remove all traces of acid, but if they are not removed the fibre becomes tender on drying. In practice, after very long washing with water, antichlor (or soap wash) is used. After treatment with antichlor the fibres are crisp and emit a crackling sound.

The soap treatment is preferred, but the soap must be thoroughly washed away, or the fibres will turn yellow. There is a temptation to leave in a considerable amount of soap, as the soap overcomes any difficulty in absorptive power. Calcium chloride is also added for a similar purpose. With some makers it is the custom to use sulphuric acid in the final acid treatment, and to allow a considerable portion of this to remain upon the fibre. This acid fibre is next treated with soap, and there is deposited with the fibre sulpholeate compounds which render the fibre soft and flexible and apparently increase its hygroscopic property. The inevitable decomposition and yellowing follow, to the ultimate detriment of the product.

The last treatment of the chemical process (No. 11) in the table should be a prolonged washing in water until no trace of soluble matter remains.

The character and quality of the water used in the preparation of cotton fibre for surgical uses is of great importance. Water acceptable for use in the ordinary processes of bleaching and dyeing will here be a source of trouble. The reason for this is easily explained. Each fibre of absorbent cotton is a capillary porous cell of absorbent cellulose. Each individual cell becomes a filter, and particles of water are taken in and passed through with great rapidity. There are about 150,000,000 fibres in a pound of absorbent cotton, and if 1,000 lb. are packed in a cylinder, and water passed through, we have a filter-bed of no mean capacity. To a certain extent these cellulose cells are capable not only of straining out sedimentary matter from the water, but also of dissociating salt and colouring matter. The fibres rapidly take up algae and other organisms. In waters containing large numbers of organisms, naturally covered with gelatinous envelopes (such as diatoms), the upper layer of closely packed cotton becomes covered with a slime, like that found in filter beds. When impure water is passed through a considerable depth of cotton, the water is to a degree purified, and the cotton rendered unfit for use. Not only is very hard water objectionable for use in the preparation of absorbent cotton on account of the reactions with the chemicals used, but also the fibres, being absorbent, hold so much of the water, that, upon drying, a portion of the lime and salts remain.*

To produce the finest product the water must be soft, clear, free from suspended matter, and, as far as possible, free also from dissolved organic matter.

Following the chemical processes come the mechanical operations noted in the table. The cotton fibres as they leave the drier are in tangled masses. So crisp are they that when pressed they emit a sound. The first of the mechanical operations which follow are for the opening out of the fibres (opening and lapping). The fibres are then carded, and as they pass from the cards gathered into layers. The fibres of absorbent cotton have a tendency to contract and form themselves into tangled nebs; hence, in well-carded absorbent cotton, the amount of card-waste is large.†

The layers, consisting of several films from the cards, placed on top of each other, are rolled up with tissue paper.

* Instances have occurred where soap was used, as noted in the process marked No. 11 in the table, and the water used in the subsequent washings contained an excessive amount of alum. In these cases it was found that the soap became coagulated, rendering the fibres non-absorbent.

† In lower grades the nebs are allowed to pass through.

This rolling in tissue is an American invention, and is of great utility, preventing the felting of the fibres, which would occur if the cotton were rolled upon itself. The cotton fibre unrolls like a sheet or blanket, and can be cut or torn with ease.

One manufacturer of absorbent cotton adds a final and most important process, viz., sterilisation. Sterilised or aseptic cotton fibre is a product of very recent times. While the methods of antiseptics have by no means been discarded, still in many conditions (as, for example, when an aseptic wound is made by the surgeon), and for many uses during the course of an operation, simple aseptic, absorbent cotton fibre is the only material required. Many hospitals sterilise the fibres at the time of use. Sterilised absorbent cotton fibre and sterilised surgical gauze and other dressings have, however, become permanent articles of commerce.

The sterilising agents used for absorbent cotton rolled in tissue is formaldehyde gas. For gauze and other dressings, steam is employed. In the laboratories in which these notes are made, the sterilising chambers are long steel cylinders similar to the chambers used in quarantine, and have a capacity of about 2,000 lb. of cotton each.

The cotton is run into the chambers, the doors are closed, the chamber is warmed, and a vacuum of about 20 ins. is drawn. Formaldehyde gas (or steam) is then admitted to the chambers, and the fibres are almost instantly penetrated. In practice, the gas or steam is removed by the vacuum pump and a fresh charge is admitted. The fibres are in contact with the formaldehyde gas for about two hours, with steam one hour.

The material is so packed that the sterilising agents can penetrate the fibres, but it is so enclosed that the cotton cannot be infected unless the packages are broken open.

Bacteriological tests, made by placing infected strips within the chambers, have demonstrated the efficiency of the process for ordinary forms of organisms.

Surgical Gauze.—Absorbent gauze cloth, made of cotton fibre, is at once a covering and protection. It may be used to bind together separated parts. Its threads act as compresses to severed blood vessels. The absorptive power of gauze is very great when properly prepared, its qualities make it the most useful wound-dressing material known.

The gauze of the cotton trade, known as "Cheese Cloth" or "Tobacco Cloth," is quite distinct from surgical gauze. In the United States, in England, and in some parts of the Continent, gauze is spun and woven solely for surgical uses.

Cotton fibre, after primary mechanical treatment as above, when it is to be made into surgical gauze, passes through a series of mechanical and chemical operations, the principal ones of which are here noted.

I. Mechanical Processes.—(1) "Combing," (2) "Drawing," (3) "Slubbing," (4) "Roving," (5) "Spinning," (6) Weaving operations: (a) Winding, (b) Warping, (c) Sizing, (d) Drawing or twisting the warp, (e) Weaving.

II. Chemical Operations.—The woven gauze cloth is made of non-absorbent fibre, and must be made absorptive. This requires operations similar to those for rendering cotton absorbent. (1) "Grey washing," (2) "Bowking," decomposition of fatty, resinous, and waxy matters in the threads preparatory to removal by subsequent operations; (3) Washing, (4) Alkaline hydrolysis, (5) Extraction of alkali and hydrolysed products, (6) Oxidation (first stage of bleaching), (7) Extraction of oxidising agents, (8) Acid oxidation, (9) Second alkaline hydrolysis, (10) Extraction of alkaline products, (11) Second acid oxidation—completion of bleaching, (12) Neutralisation of chemicals and removal of salts produced thereby.

III. Mechanical Processes.—1. Opening. The gauze cloth at this point is white and absorbent, but folded and twisted, and must be opened to full width for the next operation. 2. Tentering (stretching, drying, calendering). 3. Rolling (folding automatically). If the material is intended for antiseptic gauze, it is impregnated with the antiseptic solution at this point. 4. Packing into containers. 5. Sterilisation.

In selecting and blending the fibres, great care must be taken to secure evenness in length, freedom from leaf,

shells, dirt, and above all, to give exactly the right twist to the thread. In spinning, the object is not to secure a tight, strong, hard twisted thread, but rather an even smooth one, with the fibres so laid as to be readily rendered absorbent. A vital point is that the sizing must be one that is perfectly soluble and that can be quite removed in the main chemical processes. The process of rendering the gauze absorbent is very drastic. Considerable oxidation takes place, with an average loss of 11 per cent. in weight. The finished product is carried beyond the stage of bleaching before the desired absorptive power is reached. In small laboratories this work is carried on in the piece, while the larger establishments have automatic apparatus for the chemical washing, &c. The finishing of surgical gauze is of considerable importance.

The use of fillers, such as gums, starches, dextrines, &c., or softeners, such as soaps and fats, is very undesirable. In some grades to be found in the market the amount of such dressings is such as to preclude the use of the material with iodoform, mercuric chloride, or other sensitive antiseptics.

It is comparatively easy in trade to obtain a price for gauze much above its actual value. For example, a gauze which in the grey is 36 ins. in width will, under the ordinary treatment, finish up only 35 ins. in width. A free use of starch, however, may aid in holding it out to width. By manipulating the tentering machine, the longitudinal threads may be stretched so as to give an increase in length of from 10 to 20 per cent.

In dealing with gauze, it is usual to take a piece one inch square as a standard. If we take such a square of a fairly high grade, such as is represented by one having 40 longitudinal and 44 cross threads per square inch we shall have 84 inches of thread.

Again, the size of the thread will make a difference in the weight of cotton in each square inch.

With surgical gauzes, as found in the market, there is a marked variation in the quality of the fibre, the number of threads to the inch, and the size and weight of the threads. The National Formulary (United States, unofficial) names as standard cloths, Lehigh E. and Stillwater brands. These have 32 threads per square inch each way, and weigh about 800 grains to the square yard. The gauze cloth now found in commerce exhibits a great variation.

The earlier surgical gauzes were made of Egyptian cotton, with equal number of threads each way, hand finished. The hand finish kept the threads straight. The final product was less white but more elastic. It came from the bleach unchanged in tensile strength.

Surgical gauze is to be used as a protective covering, a bandage, and a dressing. It must have strength and sufficient power and capacity to absorb, to hold, and to act upon all discharges. It must contain nothing inimical to wound tissue. It must be aseptic; in other words, its value depends upon its preparation rather than upon its textile composition. The gauze, within its final container, is sterilized by saturated steam in a vacuum.

Classes of Cotton Dressings.—The progressive evolution of surgery has demanded cotton dressing possessing certain characteristics which may be crudely defined as follows:—Non-absorbent dressings which resist absorption into the fibres themselves. These absorb by capillarity and act as filters and protectives. Absorbent dressings capable of absorbing into the fibres and interstices the serous discharges, and solutions applied to wound surfaces. Antiseptic fibres impregnated with antiseptics, or dressings which work antiseptically, dry sterile absorbent cotton fibre which absorb serous discharges and hold them in a dry condition. Aseptic dressings free from living organisms (sterilised).

Dressings impregnated with antiseptics may still contain organisms and be the means of carrying infection to a wound; hence all dressings applied to a wound must be antiseptic and surgically clean. Sterility, once attained, must be maintained until the dressing reaches the wound surface.

Lister first impregnated lint with very pure phenol, his object being to form a crust over the wound, and thus

prevent putrefaction. This was followed by mixtures of oil and carbolic acid, carbolated pastes, and putty encased in muslin or lint, and, in 1871, gauze cloth was introduced by him. The Continental surgeons, who had been the first to adopt absorbent cotton, were also the first to impregnate the fibres with antiseptics. The list of antiseptic dressings made of cotton is to-day quite meagre. The most commonly used are mercuric chloride, iodoform, boracic acid, and Lister's gauze of mercury and zinc. The method of preparing these need not be detailed here.*

Antiseptic gauze is supplied in two forms, moist and dry. In dry gauze a volatile solvent is used, and, upon evaporation, the antiseptic is left upon the fibre. The usual standard for such a gauze would be the percentage by weight of the finished product.

In moist gauze a non-volatile solution or emulsion is made by the aid of glycerin and the gauze is impregnated, the excess of solution is extracted, and the gauze left undried. The standard adopted for such antiseptic gauze is that the gauze when dry shall contain the required percentage of antiseptic by weight.†

Mixtures of carbolic acid with oils, fats, and soaps certainly neutralise the activity of the acid, from a chemical and bacteriological point of view. Mercuric chloride forms an inert compound with serous fluids from the tissues. Lister redissolved the precipitate formed by corrosive sublimate and serum in an excess of blood serum. This preparation was quickly abandoned. The chemical activity and bacteriological power of mercuric chloride in solution depends upon its free ions. Yet in surgery, sodium chloride and ammonium chloride are used to increase the solubility of the mercuric salt. In the case of ammonium chloride undoubtedly a double salt is formed (sal-Alem-broth, Lister), and it is the free ions of the double salt that are active. Lister also introduced a so-called double salt, the cyanide of mercury and zinc. From the chemist's point of view there was in this salt no combination, and the soluble mercuric cyanide was nearly all washed away in the preparation of the mixture, leaving only zinc cyanide, an inert substance. Mercuric chloride, in contact with cotton fibre, is in the course of time reduced to oxide. The change seems to take place more rapidly if the fibre is dry. Mixtures of soap and mercuric chloride and iodoform for impregnating gauze are very common. Here there is a decomposition of the mercuric salt and the iodoform, and in turn a combination of the mercury and free iodine. All these compounds, however, satisfy the surgeon, and the chemist must be suited.

With the development of surgical technique the use of antiseptic cotton and gauze has markedly decreased. There has been a marked reduction in the proportion of antiseptics used, and a gradual abandonment of antiseptics. Plain aseptic sterilised dressings of cotton or gauze are now used in many instances, to the entire exclusion of antiseptic preparations.

In addition to the already noted forms of surgical dressings made of cotton, still others may be enumerated.

Absorbent cotton fibres, compressed into small bulk, have found considerable favour in military practice. A preparation of cotton fibres partially felted so as to form a cross between lint and loose fibres is known under the name of lintine. Combination of cotton fibre and other celluloses have also been manufactured, the advantage of the cellulose being that the fluids absorbed are soon diffused and spread over the entire area of the dressings.

There are a number of modifications of cotton fibre in use. Carbonised cotton fibres have found a very limited use in surgery. Many other fibres and substances have been suggested as substitutes for cotton or for mixing with it, e.g., peat, ramie, and flax, but all these lack one or more essential features, while cotton fibre in various forms comes more and more into use in surgery.

* Styptic cotton, i.e., cotton fibre impregnated with a solution of ferric chloride or subsulphate, belongs to the class of cottons prepared with non-absorbent fibre, its use antedates antiseptics, and it is not used in modern surgery.

† In some instances the impregnation is adjusted so that each square measure of the gauze contains a definite measure of the antiseptic.

Absorbent cotton fibre and gauze cloth, have found numerous uses in the industrial arts.

Water, watery solutions, oils, syrups, jellies, and varnishes can be strained or perfectly clarified as may be desired. Dairies consume large quantities of both cotton and gauze for the straining and clarification of milk. In chemical laboratories, in addition to use for filtering purposes, there is an increasing use of absorbents for absorption of fats, &c., as in milk analysis.

The use of prepared cellulose as an absorbent is undoubtedly capable of great extension. In this paper it has been noted that the prepared fibre has a marked power in removing certain coloured matters from solution, forming in certain instances lake-like compounds. From the basic salts of certain metals the fibres take up notable proportions of the basic oxides. This phenomenon is increased in well-prepared absorbent cotton fibre. A farther study along this line might prove of considerable value.

In the electrical industry considerable use is found for absorbent cotton fibre, as also in the preparation of films, cements, and varnishes. Absorbent cotton fibre is also utilised in the manufacture of incandescent mantles.

There is a constantly increasing demand for absorbent cotton fibres in the preparation of collodion compounds. In many of the industrial uses here noted it is required that the fibre shall be free from foreign matters and from chemicals. In certain of them the presence of immature fibres, nubs, &c., is objectionable. For other uses a low content of ash is very desirable. In bacteriological work and for filtering milk, &c., sterilised fibres are preferred.

Ash of Cotton Fibre.—A consideration of the ash in cotton fibre is important in view of the attempts of several Pharmacopœias to prescribe the amount which shall be present in absorbent cotton, and also in view of the fact that in the use of absorbent cotton for many purposes, the quantity and quality of the ash is a factor of considerable moment. The writer has often been asked for a process to produce a cotton entirely ash free. At other times trouble has arisen over the presence, in considerable quantities, of such constituents as lime, magnesium, and iron in the finished product. The table first given shows the amount of ash in samples of raw cotton fibre as found in the American market.

Ash of Raw Cotton Fibre (based on Uncleaned Fibre with Natural Moisture).—Orleans, 1.5; Texas, 1.8; Egyptian, 1.6; Sea Island, 1.8; Peruvian, 1.7; Strict Middlings, No. 300, 1.65; "East Indian," 2.72 per cent.

Davis, Dryfus, and Holland (quoted in Cotton by C. P. Brooks) gives the ash of several varieties of Indian cotton as follows:—Dhollerah, 6.22; Dharwar, 4.16; Bengal, 3.98; Broach, 3.14; Comrawuttee, 2.52 per cent.

The United States Department of Agriculture gives results of analysis of 10 samples of American staples as follows:—Minimum, 0.93; maximum, 1.80; Average, 1.37 per cent. ash.

The amount of ash in the fibre is small in comparison with the amount in other parts of the plant as shown below.

Ash of the Cotton Plant, American grown.

	Maximum.	Minimum.	Average.
	Per Cent.	Per Cent.	Per Cent.
Entire plant mature, 31 specimens in failing stage.	..	..	2.15
Roots, 18 specimens.....	1.58	0.47	0.92
Stems, 20 ".....	3.28	0.74	1.45
Leaves, 19 ".....	17.26	9.33	13.11
Bolls, 6 ".....	6.02	3.43	4.90
Burra, 3 ".....	12.06	1.70	9.21
Seed, 15 ".....	4.96	2.80	3.78
Fibre.....	1.80	0.93	1.37

In cotton fibre, as it is delivered from the market to the gin, is found a varying proportion of impurities which increase the percentage of ash. Thus the percentage of ash in absorbent cotton varies somewhat in proportion to the thoroughness with which the cotton is cleaned by the mechanical processes before chemical treatment. How much of the ash the mechanical and chemical treatment

removes is shown in the sample marked 300 (see below), where the proportion of ash in the ground fibre was 1.65 per cent., and after being made absorbent, 0.123 per cent.

As far as my researches have extended, I find the following standard for ash in absorbent cotton:—

United States Pharmacopœia, 1890.—Not more than 0.8 per cent of ash.

British Pharmacopœia, 1898.—Less than 1 per cent. of ash.

German Pharmacopœia, 4th Edition.—Not more than 0.3 per cent of ash.

The percentage of ash present in a sample of absorbent cotton sold in various markets is as follows:—American, 0.063, 0.120, 0.177, 0.180, 0.150, 0.177; American, N.P., 0.265; American, 390, 0.123; German, 0.078, 0.178; French, 0.216, 0.094; English, 0.200, 0.092.

Test for Purity.—A few of the Pharmacopœias have established standards for the purity of absorbent cotton. Among these are the following:—"Purified cotton should be perfectly free from all visible impurities and on combustion should not leave more than 0.8 per cent. of ash. When purified cotton previously compressed in the hand is thrown on the surface of cold water it should readily absorb the latter and sink, and the water should not acquire either an acid or an alkaline reaction." (Evidence of Proper Purification, U.S. Pharmacopœia, 1890.) "It should readily be wetted by water, to which it should not impart either an alkaline or an acid reaction. On incineration in air it burns leaving less than 1 per cent. of ash. It dissolves in concentrated solution of copper-ammonio-sulphate." (British Pharmacopœia, 1898.)*

"Purified cotton, moistened with water, should not change the color of litmus paper. Having been immersed in boiling water, the liquid should hardly produce an opalescence with solution of silver nitrate, barium nitrate, or ammonium oxalate. The red tint which is produced by the addition of a few drops of sulphuric acid and three drops of a solution of potassium permanganate should not disappear within a few minutes. If purified cotton is thrown on water it should become moist and sink at once. On burning it should not leave more than 0.3 per cent. of ash." (German Pharmacopœia, 4th Edition.)†

Purified cotton should readily become wet when brought into contact with warm water, and the washings should be neutral. 0.3 gm. of purified cotton when ignited and incinerated should leave no weighable amount of residue. (Pharmacopœia Svecia, 1901.)

All these standards are open to criticism; that of the U.S. P. is particularly faulty in that absorbent cotton heavily charged with impurities will, if previously pressed in the hand, sink when thrown on the surface of water. This authority is also indefinite as to the amount of water to be used. If a large amount of water is used with a small portion of cotton, alkaline or acid reaction easily escapes observation. The British Pharmacopœia is likewise open to criticism in this same respect; impure cotton may be immersed in water without imparting either an acid or an alkaline reaction.

The test of sinking in water is a test neither of purity nor of absorbent power. Soaps, glycerin compounds, and calcium chloride will increase the apparent absorbency enough to comply with this test.

A very simple test for the presence of substances added to give artificial absorbent power is, to thoroughly wash the cotton in water, to dry it thoroughly, and then to drop it in water. If it has been made absorbent by added substances its power is diminished under this treatment.

In my laboratory the following tests have been found of service in rapid quantitative work:—A portion of cotton (generally 2 grms.) is percolated with alcohol. Another portion is percolated with ether, the solvents being slightly

* The word "copper-ammonio-sulphate" in the B.P., 1893, is an error: solution of cuprammonium oxide was evidently intended.

† The following Pharmacopœias contain no reference to absorbent cotton. Pharmacopœia Espanola, Pharmacopœia Danica (1893), Pharmacopœia Chilensis (1886), Pharmacopœia Portuguesa (1876), Pharmacopœia Helvetica (1893), Pharmacopœia Belgica (1885). The Pharmacopœia Venetica (1898) gives a process for preparing absorbent cotton, but has no requirement for purity.

warmed and passed through twice. If no residue then remains upon evaporation, the extraction has been thorough. Purified ether and purified alcohol are to be used, or else there will be a residue due to impurities in the solvent.

For the presence of bleaching materials due to faulty processes, left by design, or added to give absorbent power, take 5 grms. of the absorbent cotton and wash it well with 100 c.c. of distilled water, either by letting it stand for some hours in the water or by boiling it for a few minutes. The water must be absolutely pure and the vessels perfectly clean. With pure absorbent cotton the water remains clear; bleaching chemicals and soaps show a cloudiness if present in notable quantities. If no cloudiness appears, or if it is only faintly cloudy upon concentration to half or one fourth its bulk, the water may be tested for the presence of chemicals such as chlorides (from the chlorine of the bleaching bath).

Calcium chloride (sometimes added to give hygroscopic power) and sulphuric acid may be detected by the usual tests. Salts of the fatty acids (soaps) are detected by their reaction with mercuric chloride or acetic acid. Soaps, when present in considerable amounts, are also manifest in the ether residues, and glycerin in the water residues, when the cotton is extracted with these solvents.

Tests for the purity of absorbent gauze present a much wider range than those for the purity of absorbent cotton. Here, in addition to the impurities mentioned in the foregoing, such as the natural fats, waxes, colouring matters, and bleaching chemicals, there are often present also many added substances.

The number of substances used for dressing and felting gauze to give a better finish, to make weight, or to increase the apparent size of the thread, is very large. Only those of more common occurrence are here noted. As staying or dressing materials: starch, flour, dextrine, glue, albumin, casein, gums, tragacanth, senegal, arabic, &c. Loading materials: gypsum, chalk, chlorides, and sulphates, sodium and zinc salts, china clay, barium chloride, sulphate, and carbonate. Substances added to make the fabric soft, pliable, and hygroscopic: glycerin, glucose, calcium, zinc, and magnesium chlorides, sodium, and ammonium salts. The number of substances is so large that no general method of examination can be given; specific methods for each would require too much space. The rough and simple method used in our practice is, first to examine the external or physical properties. Then a practised eye can detect filling at once. A heavily charged gauze will lose much of its filling by brisk rubbing between the fingers, and dust will fly off upon tearing.

Sydney, N.S.W., Section.

Meeting held on August 10th, 1904.

MR. HENRY G. SMITH IN THE CHAIR.

THE BACTERIAL ORIGIN OF THE VEGETABLE GUMS.—PART II.

BY R. GREIG SMITH, D.Sc.

It will be remembered that the arabin and metarabin gums were first obtained in the laboratory by growing *Bact. acacie* and *Bact. metarabinum* upon a medium containing saccharose, potato-juice, tannin, and agar. The medium as at first prepared was excellent for the purpose of producing slime, but unfortunately it subsequently became uncertain in its action, and this could only be accounted for by differences in the composition of the potato-juice, which was made at various times from different lots of potatoes. Further research, however, showed that one reason for the discrepancies lay in the fact that the bacteria rapidly lost the power of producing slime from saccharose. There

seemed also to be a variable constituent of the potato-juice, possibly dextrose, that prohibited the formation of the typical by-product. As the potato-juice medium was so unsatisfactory, a number of experiments were made with the object of obtaining a medium better adapted to the slime-forming requirements of the bacterium. This entailed an investigation into the nutrition of the organism, and incidentally a number of other questions were considered.

In experimenting with the various nutrients, the effects were measured by the weights of slime that were produced. The slimes were grown upon the surface of 20 c.c. portions of agar media which had been allowed to solidify in ordinary 9-cm. Petri-dishes. The material used for infecting the plates was prepared by growing the bacteria upon saccharose-potato-agar (without tannin) at 30° C. for from 24 to 48 hours. At that temperature the bacteria grew exceedingly well, and were practically without slime. After a certain period of incubation, the slimes were removed from the experimental agar-plates as thoroughly as possible and weighed directly. Duplicate tests made at the same time and incubated under the same conditions generally agreed, but when made at different times and possibly under different conditions, they did not always agree. The yield of slime appeared to depend largely upon the vitality of the bacterium when infected. The largest yield of slime, viz., 25 per cent. (5 grms. from 20 c.c. of medium), was obtained from the most favourable medium when the bacteria had been subcultivated for some weeks at close intervals, such as every two or three days. When the bacteria were allowed to rest for, say, a month, the amounts of slime were very much less, and after they had been subcultivated for a few months upon sugar-free media, the gum-forming faculty was temporarily lost.

A series of preliminary experiments, in which the balance was not used, indicated that a quantity of slime could be obtained upon an agar medium containing levulose, asparagine, potassium citrate, and tannin. Further experiments were made to discover the optimum quantity of each of these nutrients, &c., and the comparative effect of other nutrients.

The bacterium responded quickly to levulose, the maximum yield being obtained with 2 per cent. of sugar. The yield gradually fell until, with 10 per cent., only four-tenths of the maximum was produced. With regard to the other carbonaceous nutrients, saccharose was found to be as useful as levulose when the organism had been trained to utilise that particular sugar. Glycerin, mannite, and maltose were not quite so good, while dextrose, galactose, lactose, and raffinose were useless. A curious point was that while levulose produced the maximum quantity, invert sugar produced none. Experimental trials with mixtures of levulose and dextrose showed that as the proportion of dextrose was increased, the yield of slime decreased. Dextrose was thus not only useless for enabling the bacterium to form gum, but it also prevented the organism from utilising levulose. It was furthermore found that dextrose also prohibited the production of gum from maltose. Galactose behaved like dextrose in producing no slime and in preventing the utilisation of levulose and maltose.

These experiments with sugars have a direct bearing upon a certain hypothesis regarding the origin of gum from cellulose. Botanists seem to have agreed that gum is derived more or less directly from cellulose, probably because it had been found in certain trees in *lacuna*, which had been produced by the swelling and ultimate deliquescence of the cell walls. It is probable that the destruction of the wood tissue had been caused by the activity of microscopic moulds, and that the gum had flowed into the cavity exactly as it flows into the cavities in the fruit of the almond and the peach. Fragments of cellular tissue are sometimes found embedded in gums, such as gum tragacanth, but rather than indicating a cellulose origin of the gum, I think this points to the presence of insect life, e.g., tree-borers, in the wood in the neighbourhood of the puncture through which the gum had exuded. I have shown that the gum has a bacterial origin, so that its direct production from cellulose is out of the question. The results with the sugars show that dextrose, the hydrolytic product of cellulose, is useless for the production of gum. And if we use the name in its

broadest sense and include the hemicelluloses, pectins, and other celluloses, we know that the dextrose or galactose, which generally accompanies the other saccharine products of hydrolysis, would prohibit the formation of gum. The experimental evidence goes to show that the gum is formed by the bacteria from levulose and maltose, the wandering sugars of Brown and Morris.

When varying quantities of asparagine were contained in the media upon which the slime was grown, it was found that the maximum yield was obtained with 0.1 per cent., and that larger amounts had no effect one way or the other in modifying the activity of the organism. Upon comparing peptone, asparagine, and urea with different sugars, &c., the asparagine clearly gave the best results. With the exception of levulose, from which the same weight of slime was obtained, the yields from the urea plates, in which the nitrogen was equivalent to that in the asparagine plates, varied from two-thirds in the case of saccharose to three-fifths with mannite. Peptone gave practically no slime.

It was found, upon testing various alkaline salts, that the acid radicles fell into four groups; they either (1) accelerated, (2) were indifferent, (3) depressed, or (4) prohibited the production of slime. The first group included succinates and citrates; the second contained tartrates and, possibly, chlorides; the third had sulphates, phosphates, and oxalates; while the fourth included acetates, lactates, and formates. When the quantity of salt was investigated, it was found that 0.1 per cent. of succinate or of citrate was the optimum. Of these two salts, the latter was, if anything, the better. As the bacterium produced among its acids succinic, acetic, formic, and lactic, it is interesting to note that the first of these accelerated and the others prohibited the production of gum. One is inclined to regard the by-products of bacteria and of yeasts either as depressants or prohibitants; but succinic acid does not appear to come under either of these groups. So far as yeasts are concerned, succinates undoubtedly hasten fermentation, but possibly not more so than do phosphates.

The investigation of the action of tannin was interesting. The best quantity was 0.1 per cent., but as much as 0.3 per cent. could be used; more than that destroyed the cohesiveness of the agar during sterilisation. All tannins did not seem to have the same slime-producing effect, as it was found that a fresh lot was not so active as the older sample. In order to test the action of different known tannins upon the medium, I obtained a number of specimens from Messrs. Harrington Bros. The bacterium enabled these to be separated into two classes, one of which increased the yield of slime, and included the sumach tannins used by dyers; the other was either inactive or depressed the yield, and contained the gall-nut tannins, such as the pure forms, as well as those used by calico-printers. The addition of glycerin to the medium and a longer period of incubation checked the depression due to the second group of tannins. Since *Bact. acacia* can distinguish between certain of the tannins, it is possible that it might form the basis of a biological method for the recognition of these substances. With regard to the function of the tannin in the medium, I am of the opinion that by causing the agar-jelly to be somewhat contractile, it enables the bacteria to be slowly fed with nutrients in solution—that is to say, the bacteria can obtain the water necessary to form the slime (which contains 97 per cent. of water) much more easily when tannin is present than when it is absent.

The optimum temperature for slime formation lies about 17° C. As the temperature rises, the slime becomes less. At 22° it was two-thirds, and at 30° it was one-fourth the maximum.

From the experiments briefly treated in the foregoing, it appeared that an optimum medium for the formation of slime in the laboratory should contain levulose 2, glycerin 1, asparagine 0.1, tannin (preferably sumach) 0.1, potassium citrate 0.1, agar 2 grms., and tap-water to 100 c.c. This medium is not only an excellent substratum for enabling *Bact. acacia* to form its slime; but it is also a means of distinguishing between other gum bacteria, some of which do not produce slime upon it.

As there might be the possibility of checking the gum-flux of fruit trees by the application of saline manures, experiments were made with various salts which were added

to the optimum medium. These, however, showed that there would be little hope of checking the gum-flux with any salt, excepting, perhaps, nitrate of potash. Upon a medium prepared according to the prescription detailed above, but without glycerin, 20 grms. of slime were obtained from 100 c.c. of agar. The addition of 0.2 per cent. of potassium nitrate reduced the yield to 8 grms., and larger percentages of salt had no further influence. The same reduction was obtained with 0.6 per cent. of sodium chloride, while double the quantity checked the growth of the bacterium.

In my work connected with the formation of gum in plants and the relationship between the gum and certain bacteria, I have always endeavoured to produce the typical bacterial product in the laboratory. This was not always capable of being done, but in the present instance the production of arabin and metarabin in the laboratory by *Bact. acacia* and *Bact. metarabinum*, both isolated from the tissues of trees, was a much more decided proof that the bacteria produced these gums in the plant than would have been their production in the plant after an infection with the bacteria. The proof was more decided, for the simple reason that we could not have been absolutely certain that the trees would not have developed gum-flux independently of the infection, possibly as the result of a previous or a subsequent accidental infection with the same or other organisms.

However, an infection experiment was made, but it was done with the idea of testing if the bacterium, isolated from a member of the *acacia*, could bring about a production of gum in one of the *Rosaceae*. Peach trees, after having been infected with *Bact. acacia*, developed gum-flux, but the gum which exuded was metarabin. This was rather a curious result. That the tree should have produced insoluble metarabin after an infection with the soluble arabin bacterium was unexpected. Some light was, however, thrown upon the matter by the bacteriological examination of the infected plant. In the tissues I found *Bact. acacia*, *Bact. metarabinum*, and forms intermediate between these two organisms. The peach tree had apparently altered, and was rapidly altering *Bact. acacia* into *Bact. metarabinum*, a process which, as I have already shown, could not be done in the laboratory. It is therefore evident that the host-plant is able to modify the gum-forming faculty of the bacterium, and that so profoundly that the acquired character is practically permanent. In the case of *Bact. metarabinum*, isolated from *Acacia penninervis*, the formation of metarabin had been maintained for two years, during which time the organism had been subcultivated in the laboratory. The influence of the host-plant upon the bacterium explains how the gums from certain species of trees are so constant in character, that from the fruit trees (*Rosaceae*) being practically always the insoluble cerasin (metarabin), and that from certain *Acaciae* being always the soluble arabin.

During the research I kept in view the possibility of gum being produced industrially, perhaps from the waste liquors in the manufacture of potato-starch or from molasses, but at present there seems to be little possibility of its being prepared from these substances. The gum is not readily formed in fluid media, and the agar medium appears to be a necessity for the production of the slime in quantity. Molasses acts as a complete food for the bacterium, and the addition of other nutrients is unnecessary. It does not, however, produce a maximum yield of slime, probably on account of its excess of saline matter. Speaking roughly, 20 parts of agar, with 20 parts of saccharose, 10 of glycerin, and 1 each of asparagine, tannin, and potassium citrate would yield 250 parts of slime, containing 7.5 parts of dry slime, or, say, 6 parts of gum. The cost of producing this small quantity of gum, in materials and labour, would be in excess of its value. We must therefore look at present to growing the gum in trees and augmenting the production by the infection of suitable kinds.

In this Journal (1902, 1381) appears a paper by Mr. Thos. Steel and myself upon gum leuau, which is formed in solutions of saccharose, such as cane-juice, by the biochemical activity of *Bacillus levaniformans*. The organism is a comparatively large spore-forming bacterium, measuring 2 to 3 μ in length. I have found it frequently in plant

tissues during the investigations connected with the vegetable gums, and it undoubtedly occurs widely distributed in the vegetable kingdom. It is not, however, the only organism that can form levan. In a sweet gummy exudate from a tree, *Eucalyptus Stuartiana*, I obtained *Bact. eucalypti*, a small non-sporulating bacterium, 1μ in length, which grew in solutions containing peptone, saccharose, and salts, producing the strong opalescence so characteristic of levan. It also degraded the saccharose to reducing sugars. Both gum and reducing sugars were produced in the same proportions and at the same rate as in the case of *Bac. levani-formans*, so that the table showing the composition of the nutrient saccharose medium during the cultivation of one bacterium would also apply to the other. Practically the same acids and subsidiary products were obtained. Butyric acid was the only exception, but it is probable that, had an older culture been examined, as was the case with *Bac. levani-formans*, that acid would have been found. One point noted in addition was that the acids in the nutrient media containing chalk were formed from the reducing sugars and not from the saccharose. The activity of the organism was tested upon saccharose, but the gum was formed naturally from raffinose, the manna of the eucalypt, with which the gum was mixed.

I have found a gum-forming bacterium frequently in vegetable tissues, and although I have not yet discovered a natural gum produced by it, yet there is every probability that such does exist. It was obtained first from the sugar cane, and then in the gum-resin of *Araucaria Cunninghamhamii*, the Moreton Bay pine. It probably has nothing to do with the production of the gum of the latter, which is undoubtedly arabin.

The organism produced slime readily upon the levulose-tannin medium already described, and the slime yielded a gum which became insoluble in water after it had been coagulated by alcohol. This property altered in time, for, when the bacterium had been subcultivated in the laboratory for two years, it was no longer converted into an insoluble form when dehydrated with alcohol. The gum mucilage made paper adhere firmly to glass, and when tested was found to react as follows: Basic and ammoniacal lead acetates gave curdy masses; ferric chloride produced a brownish clot; barium hydroxide thickened the mucilage; Schweitzer's reagent produced a gelatinous slime; dilute iodine gave a reddish tinge; while Fehling's solution gave no reaction; copper sulphate, followed by potassium hydroxide, produced a gelatinous blue precipitate, which coagulated to a curdy mass upon boiling. The other usual gum reagents gave no reactions.

The gum was easily hydrolysed to galactose by 5 per cent. sulphuric acid. It was, therefore, a galactan. In saccharose media the sugar was not inverted, and, besides the gum, there were produced ethyl alcohol, carbon dioxide, lauric, palmitic, succinic, acetic, and formic acids.

In the disease known as "gummosis," or gumming of the sugar-cane, the plants become sickly and eventually die as a result of the plugging of the large vessels of the vascular strings with a yellow gum or slime. With badly infected canes the gum exudes from the ends of the bundles when the canes are cut transversely. The gum has been named vasculin by Cobb, who saw bacteria in the fresh gum. His field experiments, in which the canes were infected with gum, were inconclusive.

From the gum that exuded from the cut ends of the vascular strings of a diseased cane, I separated a bacterium to which I have applied Cobb's name, *Bacterium vasculum*. It grew slowly upon ordinary glucose-gelatin, which it slowly liquefied, as hemispherical colonies of yellow slime. A quantity of the gum was grown upon cane-juice agar, and after purification portions were tested with the usual reagents. Precipitates were obtained with neutral, basic, and ammoniacal lead acetates, barium and calcium hydroxides, copper sulphate, and ferric chloride. A slimy voluminous precipitate or coagulum was given with alcohol. The natural gum, scraped from cut canes, was tested at the same time as the bacterial product, and the reactions were found to be identical. The bacterial gum as grown upon the artificial media was similar in appearance to the natural product. This is different from those gums that have been

already recorded, but is explained by the fact that cane-gum, although it is popularly called a gum, is in reality a slime.

Mr. Thos. Steel had already done much work with the natural gum, and I have left to him the publication of its chemical nature.

A number of experiments were made with various nutrients to test their influence upon the production of slime. The product was not weighed like the arabin slimes, but the quantity was estimated visually as it appeared upon the surfaces of the agar slopes. This is not so good a method as by making use of the balance, but the yields were small in comparison with the arabin slime, and on this account the visual method seemed the better at the time. The bacterium grew well when peptone was present to the extent of from 0.1 to 0.5 per cent. Levulose, saccharose, and, to a less extent, dextrose were the only carbohydrates which favoured slime production. None was formed when glycerin, starch, dextrin, maltose, or lactose were the sources of carbon. With regard to salts, potassium phosphate was decidedly beneficial; all other salts were indecisive, with the exception of common salt, which prevented the growth of the bacterium. As sodium chloride is the only salt which acted as a poison, it is possible that it may be useful in checking the disease, the more especially as healthy crops of sugar-cane can be grown in soil containing anything under 1 per cent. But better than the use of preventives is the growth of varieties of cane insusceptible to the disease. With regard to the reaction of the medium, a faint acidity, equal to 0.01 per cent. of tartaric acid, was found to give the best result. This doubtless explains why the bacteria are to be found in the faintly acid juices of the large vessels of the vascular bundles, and not in the relatively highly acid cellular tissue, the juice of which has an acidity equal to 0.2 to 0.3 per cent. of tartaric acid. The optimum temperature was found to be 30° C.; no slime was formed at 37°. The production of the gum at the lower temperature, and not at the higher, explains why cold weather increases the prevalence of the disease. As no invertase is secreted by the bacterium, it cannot directly cause a degradation of the sugar in the cane.

Associated with a mould, a bacterium is found in the phenomenon which I have named the "red string of the sugar-cane." The bacterium produces a colourless slime from saccharose and levulose, but the mould when growing in the slime produces a red colour which becomes diffused throughout the bacterial product. The red slime fills up the large vessels of the vascular strings, producing a condition similar to that which is found in gummosis. It is, however, found only in some of the strings, and a general gummosis does not appear to be produced. The gum was obtained from the slime by the method employed in obtaining the bacterial arabin, and it was found to behave to reagents precisely like arabin. Upon hydrolysis it yielded galactose only, so that it may be called a pseudarabin. I have obtained the same gum from a yellow race of the bacterium isolated from the quince.

These instances of the formation of vegetable gums by bacteria are sufficient to indicate that all exuded gums have in all probability a bacterial origin. I would go further and say that until they can be shown to be otherwise, all vegetable gums and even mucilages are the products of bacteria.

ERRATUM.

In Part I. of this paper, this J., 1904, page 107, line 45, for *neutral* read *natural*.

DISCUSSION.

Mr. THOS. STEEL remarked that the different effects on the growth of the *Bact. Acaciae* of tannins from various sources was most interesting and suggestive, particularly in the light of much that had recently appeared on the subject of tannins in the Society's journal. It was curious to find that succinic acid, contrary to what might be expected, acted as an accelerator in producing a growth of slime by the bacterium, while oxalic had an inhibitory effect. Were the acids experimented with in the free state or combined with a base? Another most interesting fact was the remarkable change produced in the character of the bac-

terium by the host-plant, a bacterium which could not, so far, be changed in artificial cultures, at once altering its form when grown in the living tree. It was very curious to find undoubtedly different species of bacteria producing a substance of the nature of gum levan; this was probably due to the mode of attack on the sugar molecule being similar. He congratulated the author on having thrown so much light on the origin of the vegetable gums.

Dr. G. HARKER said that he was most struck perhaps by the fact that while levulose was easily converted into the gum, dextrose was perfectly immune to the attacks of the bacterium. It recalled the work of Emil Fischer on the breaking up of complex sugars by means of enzymes, in which he showed how the polysaccharide, which could be considered as a chain of $C_6H_{10}O_5$ groups differing from one another in structure, might be broken up link by link if only the right enzyme could be found to attack the last link. E. F. ARMSTRONG (Trans. Chem. Soc., Dec. 1903) had also shown how α -methyl glucoside could be converted under the influence of the enzyme maltase, into α -glucose, while β -methyl glucoside was converted by another enzyme, emulsin, into β -glucose. These forms were simply stereoisomeric. He asked Dr. Greig Smith how far the experiments were of a quantitative nature. Had he established any relation between the amount of gum formed and the quantity of sugar which disappeared? Also what tests had been made to prove that the gum obtained was the same in all cases?

The CHAIRMAN said that the marked differences shown by the action of dextrose and levulose seemed to point to a retarding influence of the aldehydic group over that of the ketonic. The action of the tannins also indicated a difference in structure. There were often several tannins in the same group of plants, and no less than three distinct tannins were found in eucalyptus exudations alone. With regard to the action of succinic acid, it seemed conclusive that nature did endeavour to get rid of this acid when formed in plants, and

this was shown by the deposition of large quantities of aluminium succinate in the trees of *Orites excelsa*. The acid in this tree was formed by the oxidation of the normal butyric acid occurring in the sap, and was perhaps brought about by bacterial agency. The economic results likely to eventuate from the author's researches were likely to be far-reaching.

Dr. GREIG SMITH said, in reply to Mr. Steel, that the acids were added as salts of potash generally, but as the cultures and the media were always faintly acid, some of the free acid would always be present. With regard to the question of Dr. Harker, the relation between the gum produced and the sugar that had disappeared was not determined, and no tests were made to see if the gum was the same in all cases. It was possible that the constitution of the complex gum molecule might vary according to the sugar employed, but as the cultural characters of the organism were constant with a particular sugar, it was probable that the gum was always the same when that sugar was used. A marked difference in the chemical constitution as evidenced by a difference in the solubility of the gum would alter the character of the bacterial colonies. This had been noted with a certain gum-forming organism, *Bact. Atherstonei*, which altered its cultural characters in the laboratory, showing the transition from an insoluble to a soluble gum. The point raised by the Chairman concerning succinic acid was interesting. Delbrück (this J., 1903, 813) said that small quantities of toxic substances stimulated yeast cells, but if this were the case why should not lactates and acetates have behaved like succinates in the case of *Bact. Acaciae*? One could always infer the behaviour of substances upon the bacterial cell from the action upon the cell aggregates or higher plants, for it had been shown by Gabrischewsky (Centralbl. f. Bakt. Orig., 32, 256) that calcium was not required by bacteria, and that therefore oxalic acid had no injurious influence upon them. Its toxicity for the higher plants was admitted.

Journal and Patent Literature.

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I.—PLANT, APPARATUS, AND MACHINERY.

ENGLISH PATENTS.

Refrigerating Machines; Carbonic Anhydride —
F. Windhausen and F. Windhausen, jun., Berlin. Eng.
Pat. 17,040, Aug. 5, 1903.

THE machine is of the counter-current type described in Eng. Pat. 9084 1901 (this J., 1902, 760), in which carbon

dioxide liquefied in the condenser passes through a regulating valve into an intermediate receiver, &c. In the present machine, this receiver, containing spaces separated by temperature-exchanging surfaces, has two tubes or coils, one within the other, into one of which a part of the liquefied carbon dioxide passes to evaporate at a higher pressure and temperature than obtains in the evaporator, and lower than in the condenser, whereby the other portion of the liquefied carbon dioxide passing through the

other tube or coil, is cooled on its way to the evaporator. (Compare also the two following abstracts.)—E. S.

Refrigerating Machines; Carbonic Anhydride — F. Windhausen and F. Windhausen, jun., Berlin. Eng. Pat. 17,040A, Aug. 5, 1903.

In machines of the type described in the preceding abstract, having an intermediate receiver, there is, according to the present invention, a double-acting compressor, the end spaces of which are connected by a channel, to which a delivery tube is attached by means of a pressure or delivery valve; and there is a movable piston or plunger for altering the volume of vapour drawn in from the intermediate receiver.—E. S.

Refrigerating Machines; Carbonic Anhydride — F. Windhausen and F. Windhausen, jun., Berlin. Eng. Pat. 17,040B, Aug. 5, 1903.

In a carbon dioxide refrigerating machine, of the type described in the two preceding abstracts, a combination is made of two compressors, so connected that one of them is double-acting for the vapours from the evaporator, whilst in the other, vapours drawn in from the evaporator are compressed at one end to about the pressure in the intermediate receiver, and are then passed to the other end, where they are compressed, together with the vapours from the intermediate receiver, to the pressure of the condenser into which they are passed.—E. S.

Distilling, Evaporating, or like Apparatus; Manufacture of — A. Jouve, Lyon, France. Eng. Pat. 21,765, Oct. 9, 1903.

SEE Fr. Pat. 330,666 of 1903; this J., 1903, 1086.—T. F. B.

Evaporating Liquors; Process of — H. H. Lake, London. From E. N. Trump, Syracuse, N.Y., U.S.A. Eng. Pat. 28,572, Dec. 29, 1903.

SEE U.S. Pat. 743,352 of 1903; this J., 1903, 1285.—T. F. B.

Vacuum Pans. H. H. Lake, London. From E. N. Trump, Syracuse, N.Y., U.S.A. Eng. Pat. 28,593, Dec. 29, 1903.

SEE U.S. Pat. 743,351 of 1903; this J., 1903, 1285.—T. F. B.

Safety Devices for Preventing Explosions in the Blast Pipes of Furnaces. P. Trapp, Falkirk, Scotland. Eng. Pat. 23,785, Nov. 3, 1903.

A FLAP valve is arranged against a seating in the upper part of the horizontal portion of the blast pipe in such a way that so long as the pressure of the blast is maintained, the valve is closed. Should, however, the blast fail, the flap drops, shutting off the blast pipe and allowing any back pressure of gas from the furnace to escape into the air.—W. H. C.

Mixers. J. F. Gandolfo, Du-Buque, Iowa, U.S.A. Eng. Pat. 3923, Feb. 16, 1904.

Two pairs of oppositely rotating, curved blades work in a bowl-shaped mixing pan, and are so arranged that they give somewhat in case of meeting any obstruction.

—W. H. C.

Furnaces; Heating — R. McAulay, Dumbarton, Scotland. Eng. Pat. 6786, March 21, 1904.

THE fuel- and air-ports are so arranged that the fuel gases from the producers are thoroughly mixed with the heated air from the regenerators, and are projected downwards towards the centre of the hearth.—W. H. C.

Grinding Mill; Improved — F. Stark, Ludwigshafen, Germany. Eng. Pat. 15,746, July 15, 1904.

A VERTICAL grinding disc rotates against a vertical grinding face, both having specially arranged cutting teeth. Means are provided for feeding the material to be ground, for renewing the grinding faces, and for regulating the feed.

—W. H. C.

Kilns and Driers; Combined Rotary — C. A. Mat-
cham, Allentown, Pa., U.S.A. Eng. Pat. 16,589, July 27,
1904. Under Internat. Conv., Jan. 11, 1904.

SEE U.S. Pat. 755,513 of 1904; this J., 1904, 435.—T. F. B.

UNITED STATES PATENTS.

Separator; Centrifugal Liquid — J. A. Dahlquist
and C. L. Holm, Assignors to Nya Aktiebolaget Radiator,
Stockholm. U.S. Pat. 770,679, Sept. 20, 1904.

SEE Eng. Pat. 5716 of 1902; this J., 1902, 1464.—T. F. B.

Drying Apparatus; Tubular — M. Salzmann, Magde-
burg-Buckau, Germany. U.S. Pat. 770,823, Sept. 27,
1904.

THE apparatus consists of a revolvable casing, inclined to the horizontal, containing two series of tubular passages, connected at the middle portion of the casing by an intermediate chamber with perforated sides. The tubes are surrounded by steam-jackets with an axial steam-supply pipe. Material supplied by suitable means to one series of tubular passages falls into the intermediate chamber, where it is pulverised by a roller, and then passes through the other series of passages into the discharge-trough.

—L. F. G.

*Treatment [Drying] of Material; Apparatus for Con-
tinuous* — W. H. Gesner, New York, Assignor to
Caribbean Manufacturing Co., New York. U.S. Pat.
771,141, Sept. 27, 1904.

MATERIAL is delivered from a mixing chamber through a normally closed opening to an inclined casing surrounded by a steam-jacket, and containing a suitably rotated hollow shaft and hollow screw through which steam circulates.

—L. F. G.

Mixer. F. A. Hetherington, Indianapolis, Ind. U.S. Pat.
770,855, Sept. 27, 1904.

ONE of the end bearings in a horizontal mixer is removable. The mixer blades are attached to a hollow shaft which fits as a sleeve over the polygonal middle portion of the rotating shaft journaled in the above bearings, so that the removable bearing can be removed, the rotating shaft withdrawn axially, and the hollow shaft with the mixer blades withdrawn transversally from the casing of the mixer.

—L. F. G.

II.—FUEL, GAS, AND LIGHT.

*Bunsen Flame; Water-Gas Equilibrium in the —, and
the Chemical Determination of Flame Temperatures.*
F. Haber and F. Richardt. J. f. Gasbeleucht., 1904, 47,
809—815, 833—837, 864—869, and 877—880.

A CRITICAL review of past work on the subject of gas flames is first given, and then an account of the authors' experiments and results. The gases evolved from the inner cone of the Bunsen flame (compare this J., 1891, 992, 993) were quantitatively examined, and the relations between the concentrations of the four substances, carbon dioxide, hydrogen, carbon monoxide, and steam, were determined. It was found that in the green inner cone the water-gas equilibrium, $\text{CO} + \text{H}_2\text{O} \rightleftharpoons \text{CO}_2 + \text{H}_2$, is produced very rapidly. The reaction-constant of the system was, within the limits of experimental error, the same as that calculated from Hahn's results (this J., 1903, 1038) for the temperature of this zone. After the withdrawal of the gaseous mixture from the combustion-zone and during the passage through the cooling zone, the equilibrium was not displaced to any notable extent. It is concluded from the experiments that the same result for the temperature of the inner combustion-zone is obtained by calculation from the composition of the products of combustion by the aid of the reaction-isochore of the water-gas equilibrium, as by thermo-electric measurements. The same numbers are also obtained by calculation from the heats of combustion and specific heats (Mallard and Le Chatelier) of the individual gases.—A. S.

Water-Gas Process; Theory of the —. v. Jüptner. Chem.-Zeit., 1904, 28, 902—903.

AN attempt is made to apply the principles of physical chemistry, especially Guldberg and Waage's equilibrium law, to the reactions concerned in the production of water-gas. The author's conclusions are that in order to obtain the best results: (1) The pressure must not be too high; (2) the temperature must not fall below 800°—900° C.; (3) with pressures up to four atmospheres the temperature should not exceed 900°—1000° C. These conditions hold for the ideal state, viz., when there is equilibrium in the generator. If there be not equilibrium, the composition of the gas will alter on its way through the generator, and its final composition will depend on the height of the coke-column, the velocity of the current of steam, and the temperature. It is of great practical importance to introduce the steam at the coldest part of the generator, so as to avoid the reaction $2CO = C + CO_2$ in the cooler parts.—J. T. D.

Aerogen Gas. Stern. Chem.-Zeit., 1904, 28, 902.

AEROGEN gas is prepared by driving air, by means of clockwork or other power, through a meter, on the drum axis of which is a hydraulic arrangement for introducing into the stream a regulated quantity of light petroleum spirit. The inflammable mixture so obtained is burned under a mantle, and gives a light of 50 candles for 100 hours at a cost of a shilling. As the mixture is made at the ordinary temperature there is no condensation; there is also practically no danger of explosion; and the gas is not poisonous. It can be used for heating and for driving small motors, as well as for lighting, and its cheapness and the simplicity of its manufacture make it most suitable for small private gas installations.—J. T. D.

Sulphur in Coal; Photometric Determination of —. S. W. Parr and C. H. McClure. XXIII., page 1000.

ENGLISH PATENTS.

Coke; Manufacture of —. J. J. C. Allison, Butterknowle, Durham. Eng. Pat. 24,670, Nov. 13, 1903.

NON-COKING coals are powdered, mixed with pitch, tar, or other bituminous matter, formed into pellets by first melting and then dropping them into water from a height. They are finally carbonised in coke-ovens.—L. F. G.

Coal; Method of Treating — for Coking Purposes. W. J. Patterson, Pittsburg, Penn. Eng. Pat. 17,580, Aug. 12, 1904.

THE coals are stored in one entire mass, as they come from the washers. This mass is allowed to stand until the water has percolated downwards, carrying the sludge with it, and the coal is then removed from the top of the mass.

—L. F. G.

Water- or like Gas from Small and Dust Coal; Apparatus for Generating —. L. Wesselsky, Dresden, Germany. Eng. Pat. 19,220, Sept. 7, 1903.

To prevent the crushing together, and consequent defective burning, of the fuel, which commonly occurs when coal dust and "smalls" are used in the production of water-gas, means are provided for lessening the pressure of the fuel on the grate, so that the combustible as consumed may by its own weight fall freely on to the grate. A horizontal supporting floor or conical body, may be arranged above the grate, in the upper part of the generator, to support the main superincumbent mass of fuel, an annular space being left round the support to enable the fuel to descend as required: in this case the grate is of inverted conical form, and is built up of rings, suitably spaced apart, a series of converging steps being thus provided for the fuel to rest upon. Different forms of apparatus, embodying the same principle, are described and claimed.—H. B.

Gas Retorts. H. Gielis, Berlin. Eng. Pat. 24,068, Nov. 5, 1903.

SEE Fr. Pat. 338,684 of 1903; this J., 1904, 653.—T. F. B.

Gas Producers. L. Wilson, Glasgow. Eng. Pat. 27,823, Dec. 18, 1903.

SEE U.S. Pat. 762,568 of 1904; this J., 1904, 745.—T. F. B.

Combustion Chambers of Steam Boilers and the like for the Manufacture and Burning of Gas; Process and Apparatus in connection with the —. P. Stien*, Rotterdam. Eng. Pat. 14,971, July 4, 1904.

THE gas generator is arranged within the combustion chamber (of the steam boiler or the like) in which the gas produced is to be burnt, so that the generator itself is maintained at the requisite temperature. The gas generator consists of a chamber divided by a horizontal grate, or perforated partition, into two compartments. Upon the grate rests an incandescent layer of reducing material, such as retort carbon, iron, or the like, and into the space above this a mixture of water, petroleum, and air is injected. The gas produced passes down through the reducing material and is discharged into a number of perforated pipes surrounding the generator; it then burns on escaping through the perforations, heating both the boiler and the generator itself. In starting the apparatus, air and petroleum alone are admitted to the generator, until the reducing layer has become incandescent.—H. B.

Gas and Air; Apparatus for the Production of Mixtures of —. A.-G. für Selas-Beleuchtung, Berlin. Eng. Pat. 15,288, July 23, 1904. Under Internat. Conv., Oct. 21, 1903.

THIS specification relates to improvements, with regard to the arrangement of valves described in Eng. Pat. 17,788 of 1903 (this J., 1904, 859).—H. B.

Gas, Poor, Free from Tarry Matters; Apparatus for Producing —. L. Boutillier, Paris. Eng. Pat. 16,763, July 29, 1904. Under Internat. Conv., Aug. 25, 1903.

THE producer described in Eng. Pat. 7979 of 1904 (this J., 1904, 653) is improved by providing the vertical distillation-retort, at its upper end, with a pipe for leading off the liberated hydrocarbons, the said pipe discharging the latter underneath the grate, to mingle with the air and steam supplies and pass up through the incandescent fuel.—H. B.

Illuminating Gas; Method of Purifying — [from Carbon Bisulphide]. A. J. Boulton, London. From C. S. Lomax, Everett, Mass., U.S.A. Eng. Pat. 14,445, June 27, 1904.

THE cooled gas, freed from tar and ammonia, but not necessarily from carbon dioxide, is passed through a purifier containing "chemically divided" sulphur (preferably spent oxide heavily charged with free sulphur), impregnated with an amine (preferably commercial aniline). The sulphur acts as a catalytic agent, in the presence of which the aniline reacts upon the carbon bisulphide in the gas, to form sulphocarbonyl and sulphuretted hydrogen, according to the equation $2C_2H_5NH_2 + CS_2 + S = CS(C_2H_5NH_2)_2 + H_2S + S$. The sulphuretted hydrogen is removed from the treated gas as usual. The aniline may, if desired, be mixed with a suitable neutral solvent to aid in disseminating it throughout the sulphur. When the purifying material becomes exhausted, it is re-impregnated with aniline, when it is ready for further use.—H. B.

Incandescent Gas Light; Method of Increasing the Intensity of —. H. H. Lake, London. From Ges. für Flüssige Gase Raoul Pictet and Co., Berlin. Eng. Pat. 20,556, Sept. 24, 1903.

VARIOUS forms of burner are described in which separate concentric supplies of combustible gas, and of air or oxygen (giving, if burnt, a non-luminous flame), are admitted to the interior of a mantle, or are projected, the one along the interior surface of the mantle and the other along the exterior surface, in order to produce a very high temperature. In other modifications, one mantle is surrounded concentrically by another, and oxygen (or combustible gas) is admitted into the interior of the inner mantle, whilst combustible gas (or oxygen) or concentric streams of oxygen and combustible gas, are admitted into the annular

space between the two mantles. (Compare Fr. Pat. 322,601; this J., 1903, 358.)—H. B.

UNITED STATES PATENTS.

Coal Briquettes; Process of Forming — E. H. Larkin, St. Louis, Mo. U.S. Pat. 770,503, Sept. 20, 1904.

ABOUT 3 per cent. of crude petroleum is mixed with 97 per cent. of coal slack, and to this mixture starch paste is added in the proportion of about 2 lb. of the paste to each 100 lb. of the petroleum-treated slack, the whole mass being finally pressed into blocks.—W. C. H.

Coal; Method of Treating and Handling — for Coking Purposes. W. J. Patterson, Pittsburg. U.S. Pat. 770,778, Sept. 27, 1904.

SEE Eng. Pat. 17,580 of 1904; preceding these.—T. F. B.

Gas Producers, Furnaces, &c.; Apparatus for the Continuous Feeding and Distributing of Material in — C. W. Bildt, Stockholm. U.S. Pat. 770,491, Sept. 20, 1904.

SEE Eng. Pat. 9376 of 1904; this J., 1904, 709.—T. F. B.

Gas; Process of Manufacturing — A. Bongault, Assignor to Soc. Franç. de Constructions Mécaniques (Ancien. Établ. Caill), Paris. U.S. Pat. 770,554, Sept. 20, 1904.

SEE Eng. Pat. 12,506 of 1903; this J., 1903, 1079.—T. F. B.

FRENCH PATENTS.

Heating Appliances, the Heat of which is Produced by a Chemical Reaction. Hunger and Uhlig. Fr. Pat. 342,915, May 6, 1904.

A CYLINDRICAL metal vessel with a conical bottom is filled with lime or caustic soda, and a metal funnel containing water or vinegar placed inside, resting on the rim joined to the vessel. The funnel is provided with a hole near its apex, and with a metal cover pierced by a hole, whilst a hole is also pierced in the top of the cylindrical vessel. A strip of steel passes over the various holes so as to close them, and projects through the cover. On winding the strip round a key, the holes can be opened and the chemicals allowed to react.—L. F. G.

Drying Oven, Continuous —, for Combustible Materials and the like. P. H. Pute-Cotte de Renéville. Fr. Pat. 343,089, May 11, 1904.

THE oven is especially designed for the drying of briquettes, and consists of an upright square tower containing a set of inclined shelves arranged zigzag fashion. The material is fed in at the top, and, whilst sliding down the shelves is dried by a current of hot gases passed in from a furnace. In order to keep the tower hermetically closed, the material is fed into a conical hopper divided into two vertical compartments, which rotates slowly round an axis, the material being discharged alternately from each compartment, as the latter passes over a hole situated in the cover of the tower.

—L. F. G.

[*Gas Manufacture.*] *Method for Completely Distilling Coal, and Apparatus for Use therein*. H. W. Woodall and A. M. Duckham. Fr. Pat. 343,091, May 1, 1904. Under Internat. Conv., July 27, 1903.

SEE Eng. Pat. 16,497 of 1903; this J., 1904, 744.—T. F. B.

Tissue for Incandescent Gas Mantles. H. Loewenthal. Fr. Pat. 338,931, July 18, 1903.

FABRICS for the manufacture of mantles are made of threads of "compounds of cellulose soluble in water."—H. B.

Wicks of Artificial Silk for Candles. V. Piersdorff. Fr. Pat. 343,086, May 11, 1904.

CLAIM is made for the use of twisted or plaited wicks of artificial silk, and especially of the waste material. It is

stated that such wicks absorb fat more readily than cotton wicks, and burn without carbonisation.—C. A. M.

Candles, Lamp Oils, Edible Fats, Unguents or Pomades, Soaps, &c.; Manufacture of — C. Dreymann. Fr. Pat. 343,158, May 14, 1904. XII., page 988.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM, AND MINERAL WAXES.

Petroleum; A Radio-active Gas from Crude — E. F. Burton. XXIV., page 1003.

ENGLISH PATENTS.

Tar; Process for Treating — for the Elimination of Water and Recovery of Volatile Products therefrom. W. Oppenheimer and T. O. Kent, London. Eng. Pat. 12,696, June 5, 1903.

SEE Fr. Pat. 334,472 of 1903; this J., 1904, 55.—T. F. B.

Peat and Turf; Treating [Distilling] — to obtain valuable Products. T. R. Hammer, Manchester. Eng. Pat. 24,326, Nov. 10, 1903.

AIR-DRIED turf, peat, or bog is heated in a retort, and the products of distillation are separated and collected for the making of wood spirit, acetic acid, tar, and charcoal. The gas is to be utilised for heating the retorts, or for "burning purposes."—L. F. G.

UNITED STATES PATENT.

Ammonia-Water Apparatus. H. A. Abendroth, Berlin. U.S. Pat. 771,031, Sept. 27, 1904.

THE apparatus is provided with superposed cells having covered openings or doors in the side, and near these openings, overflow pipes supported in the bottoms of the cells. These overflow pipes are made in sections, telescoping one in the other. Compare U.S. Pat. 712,891 of 1902; this J., 1902, 1526.—E. S.

FRENCH PATENTS.

Tar; Process of Solidifying — S. G. Coulson. Fr. Pat. 343,691, June 4, 1904. Under Internat. Conv., Jan. 28, 1904.

SEE Eng. Pat. 2102 of 1904; this J., 1904, 780.—T. F. B.

Hydrocarbons, such as Crude Petroleum and Petroleum Oils of all Densities; Process for Refining Commercial — H. P. J. B. Goffart. Fr. Pat. 342,588, April 23, 1904.

THE hydrocarbon is treated with a metallic powder, such as zinc, which acts catalytically and at the same time as a reducing agent, decomposing the colouring matter and reducing the unsaturated hydrocarbons, which are stated to be generally more highly coloured than the saturated compounds. For example, petroleum of sp. gr. 0.835 to 0.840 is refined by keeping it in contact with powdered zinc placed on an asbestos filter contained in a jacketed funnel, a temperature of about 70° C. being maintained for five hours. Correspondingly higher temperatures and longer treatment are required for heavier oils, and very viscous oils are advantageously treated under pressure.—T. F. B.

Petroleum or other Mineral Oils; Process for Solidifying — with a view to their Application for Heating. V. J. Kuess. Fr. Pat. 343,545, May 30, 1904. Under Internat. Conv., Nov. 6, 1903.

SEE Eng. Pat. 7481 of 1904; this J., 1904, 817.—T. F. B.

IV.—COLOURING MATTERS AND DYESTUFFS.

Rosanilines; Nomenclature of — J. Schmidlin.
Comptes rend., 1904, 139, 504—505.

THE author proposes to take as the basis of his nomenclature the real base of Parafuchsine, $(C_6H_4NH_2)_2:C:C_6H_4:NH$, which he terms rosaniline. The corresponding carbinol is designated rosanilinecarbinol, whilst Parafuchsine would be rosaniline hydrochloride. The homologues of the base of Parafuchsine are called rosamonotoluidine, rosaditoluidine, and rosatritoluidine, containing one, two, and three toluidine nuclei respectively. The leuco bases are called leucaniline, leucomono-, leucodi-, and leucotritoluidine. Thus the corresponding terms in the author's nomenclature and that of Baeyer (this J., 1904, 862) are:—

Baeyer.	Schmidlin.
Diaminofuchsonimine. Diaminodimethylfuchsonimine. Diphenylaminofuchsonphenylimine.	Rosaniline. Rosaditoluidine. Triphenylrosaniline.

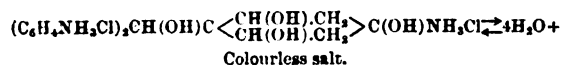
—E. F.

Tetrahydroxycyclohexane-Rosanilines: a New Class of Colourless Derivatives. J. Schmidlin. Comptes rend., 1904, 139, 506—507.

THE salts of rosaditoluidine and rosatritoluidine are very soluble in strong hydrochloric acid. If the solution be allowed to stand for 24 to 48 hours, the liquid becomes decolorised and transformed into a mass of perfectly white crystals. These are extremely soluble in water. They are stable at the ordinary temperature. At 50° C. they lose 4 mols. of water, forming black trihydrochlorides, which dissolve in water to a red solution. On heating the colourless compounds to 100° C. they form characteristic green Magenta homologues.—E. F.

Carbinol Salts and Cyclohexane-Rosanilines: Phenomena of Decolorisation. J. Schmidlin. Comptes rend., 1904, 139, 521—524.

THE fact that the colourless salts of tetrahydroxycyclohexane-rostaniline lose 4 mols. of water on heating, with formation of black compounds (see preceding abstract) is regarded as a direct proof of the quinonoid constitution of rosaniline salts, thus:—



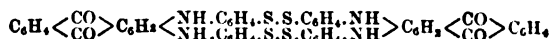
It is found that when solutions of rosaniline salts are decolorised by addition of mineral acid, heat is evolved; also, a solution of rosanilinecarbinol in acetic acid loses its colour, but absorbs heat, approximately the same amount as is evolved in the former reaction. Hence it is concluded that these colourless compounds are salts of rosanilinecarbinol, $C(OH)(C_6H_4NH_2.HCl)_2$. The only salt of this class which could be obtained in a fairly pure state was the trihydrochloride of hexamethylrosanilinecarbinol; it is exceedingly hygroscopic, turning black on exposure to moist air, and giving a highly coloured solution in cold water. When the carbinol salts are neutralised by acid, heat is evolved, the benzene nuclei being converted into hexahydrobenzene nuclei; these cyclohexane salts, on treatment with acid, lose 4 mols. of water (heat being absorbed), and are converted into the quinonoid rosaniline salt.—T. F. B.

Sulphur Dyestuffs; Study of the — P. Friedlaender and F. Mauthner. Z. Farben- u. Textil-Ind., 1904, 3, 333—337.

THE method of study adopted by the authors consisted in the preparation of simple sulphur-containing dyestuffs synthetically, in order that from a study of their properties conclusions might be drawn as to the composition of the more complicated commercial products. As a starting point, use was made of aromatic compounds which contain amino or hydroxy groups. These compounds can, in many cases, be easily "sulphurised" either by boiling with sodium polysulphide solution or by other means. The number of sulphur atoms entering the molecule depends on the conditions. As a rule, in "alkaline sulphurising," the sulphur takes up the ortho position to the amino or hydroxy groups, and the *o*-aminomercaptans and *o*-hydroxymercaptans obtained, must be looked upon as the chief components of the dyestuff formation. If the reaction be carried further, these primary mercaptans change rapidly, and condensations of various kinds take place, by preference thiodiphenylamine derivatives being formed from simple benzene derivatives. The sulphur which enters into the rings of these compounds appears not to be affected by sodium sulphide; the solubility of the sulphide dyestuffs must therefore be due to the presence of sulphur in other forms of combination probably as -SH groups or bisulphides, which latter are easily changed by sodium sulphide into soluble mercaptans. A sulphide dyestuff should fulfil the following conditions:—(I.) It should have a molecule with one or more chromophor groups. (II.) It should have bisulphide groups in the molecule, which cause it to be soluble in sodium sulphide with formation of -SH groups, this reduced body being reconverted into the original substance during the dyeing process. (III.) It should have the property, not necessarily following from I. and II., of dyeing unordanted cotton direct from sodium sulphide baths. The authors have prepared a large number of dyestuffs containing sulphur which answer the above conditions entirely or in part.

Azo Dyestuffs containing Sulphur.—*o*-Dihydroxydiphenylbisulphide was prepared by pouring a solution of potassium xanthate into diazotised *o*-aminophenol. The bisulphide combines with diazotised naphthionic acid in alkaline solution. The free colour-acid forms yellowish-brown needles very slightly soluble in water. The formula is $SO_3H.C_{10}H_6.N:N.C_6H_3(OH).S.S(OH).C_6H_3.N:N.C_{10}H_6.SO_3H$. Alkalis give easily soluble salts. Sodium sulphide colours it violet, slowly in the cold and quickly on heating, but the colour goes back on exposure to the air, the bisulphide group being split off and an azo derivative of thiopyrocatechol formed. In this case the attraction of the fibre for the sulphur compound is practically no greater, either in alkaline or in sodium sulphide solution, than it is for the combination of naphthionic acid and phenol, so the sulphur has here no influence on the dyeing properties. The compound from benzidine and 1 mol. of dihydroxydiphenylbisulphide is, on the contrary, a direct-dyeing cotton dyestuff. The compound from 1 mol. of benzidine, 1 mol. of *α*-naphthylamine, and 1 mol. of dihydroxydiphenylbisulphide is almost insoluble in alkalis, and is only dissolved very slightly by sodium sulphide, so that the presence of the bisulphide group here is not enough to make the large molecule soluble enough for use in dyeing.

Quinone-imine Dyestuffs containing Sulphur.—The dyestuff produced by the action of diaminodiphenylbisulphide on gallocyanine has no affinity for the cotton fibre, but dissolves in sodium sulphide solution. Diaminodiphenylbisulphide reacts on quinizarin in the presence of acetic and boric acids. The leuco body formed at first oxidises rapidly to a dark blue insoluble dyestuff, which can be crystallised from ethyl benzoate and quinoline, and has apparently the formula—

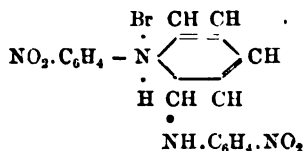


The dyestuff is not dissolved by alkaline sodium sulphide, but dissolves in alkaline hydrosulphite to form an indigo-like vat with a blue bloom, which dyes cotton a fast bluish grey. The sodium sulphide is not strong enough to make

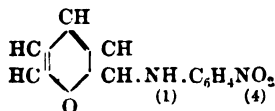
it soluble, and the hydrosulphite does so owing to the fact that it reduces the carbonyl groups as well.—A. B. S.

Pyridine Dyestuffs. W. König. J. prakt. Chem., 1904, 70, 19–56.

α-p-Nitrophenylamino-p-nitrophenyldihydropyridonium bromide—



a compound probably existing also in the tautomeric form $\text{NO}_2 \cdot \text{C}_6\text{H}_4 \cdot \text{NH}(\text{HBr}) \cdot \text{CH} \cdot \text{CH} \cdot \text{CH} \cdot \text{CH} \cdot \text{CH} \cdot \text{N} \cdot \text{C}_6\text{H}_4 \cdot \text{NO}_2$ is obtained by the action of cyanogen bromide on a mixture of pyridine and *p*-nitraniline dissolved in absolute alcohol. It forms bluish-red plates, m. pt. 149° C., or dark blue needles; is insoluble in water, ether, and benzene, moderately soluble in alcohol and acetic acid with a pink colour and yellowish-green fluorescence, and easily soluble in pyridine. It dyes silk from an alcoholic solution a pink colour which is very fugitive to light. Concentrated hydrochloric acid decomposes it, according to the conditions of reaction, into either *p*-nitrophenylpyridonium chloride or tetrachlorohydroquinone. Sodium carbonate, at the ordinary temperature, has no action upon it. Caustic soda, under the same conditions, precipitates a red compound, which, on the further addition of the reagent, becomes in turn brownish-red and dull purple. On heating with this reagent, the compound is decomposed into a substance which has not been identified, but which has the characteristic odour of, and appears, in fact, to be crotonaldehyde, anhydroglutaconic-aldehyde-*p*-nitraniline, or, as it is proposed to term it, *α-p*-nitrophenylaminopenfuran—



being formed as an intermediate product. Bromine acts upon the dyestuff, forming dibromo-*p*-nitrophenylpyridonium perbromide, which, on boiling with acetic acid or acetone, is resolved into 2,6-dibromo-4-nitrophenylpyridonium bromide. The isomeride of the above dyestuff, prepared from *m*-nitraniline, of m. pt. 167° C., dyes silk in an orange colour with a faint yellowish-green fluorescence. The analogous dyestuffs, obtained from *o*- and *m*-toluidine and *o*- and *p*-anisidine, dye silk in orange, orange salmon-pink, and pink colours respectively. The compound (m. pt. 175° C.) derived from *p*-aminodimethylaniline dyes silk and wool in violet shades resembling those yielded by Crystal Violet. Ammonia and caustic soda change the colour of the aqueous and alcoholic solutions of this dyestuff to pale yellow, the original colour not being restored by the addition of acids.—E. B.

Nitrotoluene; Electrolytic Reduction of — W. Löb and J. Schmitt. XI. A., page 987.

Photographs in Natural Colours by the Three-Colour Process; Use of Leuco Bases for the Preparation of — E. König. XXI., page 998.

ENGLISH PATENTS.

Colouring Matters Containing Sulphur [Sulphide Dyestuffs] and Intermediate Products; Manufacture of — G. W. Johnson, London. From Kalle and Co., Biebrich-on-Rhine, Germany. Eng. Pat. 19,973, Sept. 16, 1903.

SEE Fr. Pat. 335,383 of 1903; this J., 1904, 183.—T. F. B.

Acid Nitriles [Omega-cyanomethylaniline Derivatives]; Manufacture of — J. Y. Johnson, London. From Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, Germany. Eng. Pat. 25,464, Nov. 21, 1903.

SEE Fr. Pat. 338,818 of 1903; this J., 1904, 820.—T. F. B.

Azo Dyestuffs; Manufacture of New — H. E. Newton, London. From Farbenfabr. vorm. F. Bayer and Co., Elberfeld, Germany. Eng. Pat. 26,132, Nov. 30, 1903.

SEE Addition, of Nov. 27, 1903, to Fr. Pat. 323,808 of 1902; this J., 1904, 747.—T. F. B.

FRENCH PATENTS.

Omega-cyanomethylantranilic Acid; Production of — [Indigo Dyestuffs.] Badische Anilin und Soda Fabrik. Fr. Pat. 338,902, July 1, 1903.

SEE Eng. Pat. 14,676 of 1903; this J., 1904, 604.—T. F. B.

Fluoranes, Halogenated; Production of — Badische Anilin und Soda Fabrik. Fr. Pat. 342,518, April 21, 1904.

DICHLORO- and dibromofluorane and their derivatives are obtained by condensing phthalic anhydride or its halogenated derivatives with *m*-chloro- or *m*-bromophenol, their homologues or halogenated derivatives in presence of a condensing agent. The products are colourless crystalline powders, readily soluble in chloroform and hot nitrobenzene, and soluble in sulphuric acid with yellow to olive coloration. The preparation of two new compounds, *o*-chloro-*p*-cresol and 3,4-dichlorophenol, is also described in the patent. They are obtained by diazotising *o*-chloro-*p*-toluidine and 3,4-dichloro-aniline respectively, and boiling the resulting solutions.—E. F.

Indigo; Manufacture of — L. Lilienfeld. Fr. Pat. 348,078, May 11, 1904.

THE aromatic glycins, such as phenylglycin, are heated *in vacuo* or in an indifferent or reducing gas (nitrogen, hydrogen, coal-gas, &c.) with caustic alkalis and some condensing agent, such as metallic sodium or the metals of the alkaline earths or the oxides of these metals. When the action is finished, the cooled mass is dissolved in water and the indoxyl oxidised to indigo by blowing in air. By using homologues or derivatives of the aromatic glycins, corresponding indigo derivatives are obtained.—A. B. S.

Cyanines [for Photographic Purposes]; Process for Making New — Act.-Ges. f. Anilinfabrikation. Fr. Pat. 342,656, April 26, 1904. XXI., page 999.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

Cotton from Trinidad. Bull. Imp. Inst. (Suppl. to Board of Trade J.), 1904, 2, 173.

THE cotton is known locally as "Creole," or native cotton, and appears to be a short-stapled or "Upland" variety. The sample examined was of a pale cream colour, well cleaned, rather rough to the touch, and fairly strong. The length of the staple was 1.2–1.4 ins., which is a little above the average (1.1 in.) for American "Upland" cotton. Commercially it would be worth 8½d.—9d. per lb. "Upland" cotton is stated to be better suited to the Trinidad climate than "Sea Island" cotton.—A. S.

Fibres from Southern Rhodesia. Bull. Imp. Inst. (Suppl. to Board of Trade J.), 1904, 2, 168–169.

Sisal Hemp.—The sample was stated to have been derived from a species of *Agave*. It consisted of soft, fine fibre, of good colour, well cleaned, and fairly strong; average length of staple, 33 ins. It is said to resemble Mauritius hemp rather than Sisal hemp, and is worth 32l.—34l. per ton. (See also this J., 1903, 1192.)

Banana Fibre.—The specimen consisted of a somewhat soft fibre, of a dull, pale brown colour, of fair strength; it was stronger and more even than is usually the case with banana fibre; average length of staple, 27 ins. It is worth 25l.—26l. per ton. (See also this J., 1903, 737.)

Pineapple Fibre.—This consisted of very fine, white, well-cleaned fibre, strong but very short; average length of staple, 11 ins. If the fibre could be obtained of greater

length it would be worth 30*l.*—40*l.* per ton. Pineapple fibre is stated to be used in India and China as a substitute for silk, for mixing with wool or cotton, and in the manufacture of lines and thread. In the Philippines it is used for the preparation of the fabrics called "piña" and "rengue."

Baobab Tree Fibre.—The sample consisted of the bark of the tree in an unprepared state. The soft inner bark would probably be worth 4*l.*—5*l.* per ton. The fibre was used some years ago for the manufacture of strong, light-coloured wrapping papers, and was then sold at 8*l.*—10*l.* per ton.—A. S.

Mercerising Industry; Studies on the —.

F. J. G. Beltzer. *Monit. Scient.*, 1904, 18, 732—748.

THIS is a summarised account of the process of mercerising, and treats the subject under the following headings:—Preliminary treatments (gas-singeing, scouring, bleaching); mercerising liquids (alkaline, acid, and neutral); measurement of the degree of mercerising; mercerising apparatus, giving a general description of the various types of machines in use; mercerising threads before being made into skeins; dyeing mercerised cotton; examination of the brilliancy of mercerised cotton; mercerising fabrics; gas-singeing mercerised dyed fabrics; examination of mercerised fabrics; mercerising ramie. The article concludes by giving a general idea of the cost of the various stages of the process, including the cost of labour.—T. F. B.

Cotton; Weakening of — by Acids under the Influence of Hot Air and Steaming. A. Scheurer. *Bull. Soc. Ind. Mulhouse*, 1904, 74, 211—219.

EXPERIMENTS were made on the effect of oxalic, lactic, tartaric, citric, thiocyanic, *o*-, *m*-, and pyrophosphoric and phosphorous acids on cotton under the influence of dry and moist heats. Solutions of oxalic acid containing 10 and 20 grms. per litre were used, and solutions of the other acids of equivalent strength. Thiocyanic acid had the greatest effect on the tensile strength of the cotton in a dry atmosphere at 40°—50° C., the stronger solution causing the tensile strength to fall to less than half its original value after 72 hours; the effect of thiocyanic acid and steam is so small as to be negligible. Meta- and pyrophosphoric acids, in the stronger solutions, caused a reduction of about one-third of the tensile strength, both after three days hot-air treatment and after one hour's steaming. The action of phosphorous and oxalic acids was somewhat less, the reduction being from 25 to 27 per cent. in either case. Lactic, orthophosphoric, tartaric, and citric acids, in the order named, had still less effect on the tensile strength of the cotton, the reduction lying between 10 and 20 per cent. The addition of glucose to the printing mixture containing oxalic acid diminished the destructive action of the acid under the influence of hot air or steam to a considerable extent, particularly in the former case.—T. F. B.

Mordant Theories and the General Working of Mordanting with Primary Metallic Mordants. P. Heermann. *Färber-Zeit.*, 1904, 15, 284.

A REPLY to Knapstein, with the object of pointing out inaccuracies in his criticisms (this J., 1904, 898).—T. F. B.

Theory of Dyeing; Contribution to the —. E. Knecht. *Ber.*, 1904, 37, 3479—3484.

FROM a series of determinations of the amounts of dyestuff taken up by wool in dyeing with a number of acid dyestuffs of homologous or analogous series with addition of sulphuric acid, it is shown that the amounts are proportional to the molecular weights of the dyestuffs, if the same conditions be observed. This result holds good if the amount of dyestuff used be varied from 6½ to 50 per cent. of the weight of the wool. The amount of water used can be varied between fairly large limits without affecting the quantitative results; this is contrary to the "solution theory." The solubility of the dyestuff in water also appears to be without influence. The sulphuric acid used must do more than simply liberate the free colour acid, for, if the dyeing be effected with 2 per cent. of the free

colour acid of "Crystal Ponceau," without addition of another acid, the bath will not be nearly exhausted, whilst, in presence of sulphuric acid, exhaustion is nearly complete. These facts are greatly in favour of a "chemical theory" of dyeing.—A. B. S.

Paranitraniline Red; Action of Amines on the "Mordant" of —. C. Favre. *Bull. Soc. Ind. Mulhouse*, 1904, 74, 268—269.

THE addition of certain aromatic amino-compounds to the β -naphthol solution used for dyeing fabrics with Paranitraniline Red, has a considerable influence on the shade of the resulting dyeings. Thus, the addition of 20 per cent. of α -naphthylamine (on the weight of β -naphthol used) gives deep brown shades, fast to soaping, but not to light; the same quantity of β -naphthylamine changes the shade to brick-red, fast to soaping and light; whilst *m*-toluylene-diamine produces chocolate shades, also fast to soaping and light.—T. F. B.

Half-Discharges on Tannin Mordants; Process for Producing —. C. Zundel. *Bull. Soc. Ind. Mulhouse*, 1904, 74, 220—221.

ON printing fabrics, impregnated with tannin, with solutions of alkaline salts of potassium or sodium, such as silicates, sulphites, borates, carbonates, thiosulphates, &c., and subsequently steaming, a portion of the tannin is converted into gallic acid. After fixing, the portions of the fabric containing gallic acid are not dyed in such deep shades as the remainder of the fabric. The best results were obtained with a solution of normal potassium sulphite (39° B.) thickened with starch, the dyeing being performed with a basic dyestuff. O. F. Alliston, in a report to the Society, confirms these results, and finds also that all the above-mentioned salts, with the exception of the alkali thiosulphates, give similar half-discharges on fabrics mordanted with antimony tannate.—T. F. B.

Soda Water-Glass; Analysis of —. P. Heermann. *XXIII.*, page 1000.

Molasses; Purification of — by Electrolysis. [Substitute for Tartaric Acid as By-Product.] L. Gurwitsch. *XVI.*, page 993.

ENGLISH PATENTS.

Cotton and Flax, Raw, and Cotton and Linen Goods; Treatment of —, to Reduce the Inflammability thereof. W. H. Perkin, jun., and Whipp Bros. and Todd, Ltd., Manchester. *Eng. Pat.* 24,922, Nov. 7, 1903.

RAW cotton or flax, and cotton and linen goods can be rendered fireproof by means of sodium stannate, without subsequent treatment with solutions of metallic salts or ammonium salts (see *Eng. Pat.* 8509 and *Fr. Pat.* 321,063 of 1902; this J., 1903, 623 and 142). The goods may be impregnated with a solution (30° Tw.) of sodium stannate, dried, and exposed to the air for some days, an insoluble fireproofing compound being thus formed in the fibre. See also this J., 1903, 92 and 294.—T. F. B.

Fabrics and Similar Materials; Means of Heating —. W. Mather and G. G. Hepburn, Manchester. *Eng. Pat.* 24,617, Nov. 12, 1903.

FABRICS "and similar materials" are heated by passing them, in a wet or dry state, through a bath of mercury, heated to the desired temperature. A suitable apparatus consists of a vat, the bottom of which is made with a number of semi-cylindrical troughs, adapted to contain the mercury; a rotating roller is fixed in each trough, and a roller is also supported between each pair of troughs, immediately over the partition between them, so that the fabric as it passes over the rollers, is alternately immersed in and removed from the mercury. These troughs are conveniently heated by gas-jets. The vat is provided with a cover, having a deep flange, which dips in a suitable liquid contained in a trough, which is provided round the upper edge of the vat; by this means a liquid seal is formed, loss of mercury vapour being thereby prevented.—T. F. B.

Yarn-dyeing Vat, with a Device for throwing in and out of Gear a Windlass for Lifting the Material out of the Colouring Liquor. E. J. Heuser, Cottbus, Germany. Eng. Pat. 2062, Jan. 27, 1904.

THE yarn is hung on horizontal rollers, which fit into a frame, which can be lifted bodily out of the dye-bath by means of a rope and pulley. These rollers each have a cog-wheel at one end, so that adjacent rollers revolve in opposite directions. The lifting arrangement is connected with a clockwork mechanism, so that after an arranged time the frame is automatically lifted out of the vat until it reaches a certain height, when it operates a lever, which throws the driving belt out of gear and stops the machine.

—A. B. S.

Dyeing, and Apparatus therefor. J. O. O'Brien, Manchester. From H. l'Huillier, Paris. Eng. Pat. 13,302, June 13, 1904.

SEE Fr. Pat. 338,113 of 1903; this J., 1904, 605.—T. F. B.

Calico Printing. The Calico Printers' Association, Ltd., Manchester, and J. Garnett, Alexandria, N.B. Eng. Pat. 27,539, Dec. 16, 1903.

THE cloth is first slop-padded or otherwise prepared or printed with a solution of β -naphthol, neutralised with caustic soda, and then treated by one of the two following processes. (1) The cloth is printed with a thickened, diazotised solution of *p*-nitraniline or other amine, and then printed by another roller with an organic acid (e.g., tartaric acid or citric acid); the cloth is now mordanted, steamed, and dyed with a suitable dyestuff, e.g., a basic dyestuff mixed with tannic acid. (2) The prepared cloth is printed with a mordant and then with a resist for the azo dyestuff (with another roller); it is now treated with a thickened diazotised solution of an amine, fixed, and finally dyed as in the first process.—T. F. B.

UNITED STATES PATENT.

Mercerising Yarn; Apparatus for —. I. E. Palmer, Middletown, Conn. U.S. Pat. 770,920, Sept. 27, 1904.

A SUITABLE framework, mounted in the mercerising tank, carries two yarn-supporting reels, one above the other; the lower one is fixed, whilst the upper one is vertically adjustable, and can be removed in order to place the yarn in position. The gearing is so arranged that both reels can be rotated, whatever the position of the upper reel.

—T. F. B.

FRENCH PATENTS.

Fibres and Fibrous Substances; Process for Treating [Felting] —. G. Goldman. Fr. Pat. 342,941, Feb. 15, 1904. Under Internat. Conv., Aug. 29, 1903.

SEE U.S. Pats. 758,243 to 758,247 of 1904; this J., 1904, 544.—T. F. B.

Retting and Degumming Vegetable Fibres; Process of —. E. Poisson. Fr. Pat. 338,941, July 24, 1903.

THE soluble soda or potash soaps which are formed by the decomposition of the fatty matter of vegetable fibres by treatment with alkali, are converted into insoluble soaps by treatment with solutions of aluminium or magnesium salts; after this treatment, the stalks, &c., can be much more easily removed from the fibre. The same treatment may also be applied to fibres which have been degummed by treatment with soap.—T. F. B.

*Dyeing Furs, Hair, Feathers, and similar Materials by Means of *p*-Amino-*p*-hydroxydiphenylamine; Process of* —. Farbwerke vorm. Meister, Lucius und Brüning. Fr. Pat. 338,915, July 8, 1903.

UNMORDANTED skins are dyed bluish-grey to blue-black by treatment with an ammoniacal solution of *p*-amino-*p*-hydroxydiphenylamine in presence of oxidising agents. By similarly treating furs mordanted with chromium salts, good blacks are obtained. The following is an example of the process:—2 grms. of *p*-hydroxy-*p*-aminodiphenylamine are dissolved in 200 c.c. of water containing 2 c.c. of ammonia (sp. gr. 0.91), 50 c.c. of a 3 per cent. solution of

hydrogen peroxide is added, and the solution made up to 1 litre. The skin is worked in this solution for an hour, and allowed to remain for a further 12 hours.—T. F. B.

Dyeing Furs, Hair, Feathers, and similar Materials by Means of 2-Nitroso-1-naphthol and 1-Nitroso-2-naphthol; Process of —. Farbwerke vorm. Meister, Lucius und Brüning. Fr. Pat. 338,919, July 9, 1903.

THE materials (furs, feathers, skins) are dyed with a solution of either 1-nitroso-2-naphthol or 2-nitroso-1-naphthol, with or without the addition of oxidising agents. A suitable bath for chrome-mordanted skins consists of 2 grms. of 2-nitroso-1-naphthol and 20 c.c. of a 3 per cent. solution of hydrogen peroxide, with or without 2 c.c. of ammonia (sp. gr. 0.91), the whole made up to 1 litre. Reddish-brown shades are obtainable by this process.

—T. F. B.

Dyeing Hair, Feathers, and Furs; Process of —. Act. Ges. f. Anilinfabrikation. Fr. Pat. 342,714, April 28, 1904.

HAIR, feathers, or furs are dyed yellow to clear brown shades by treatment with dilute alkaline solutions of 1,2-naphthylenediamine or its sulphonic acids in presence of an oxidising agent. For example, a 3 per cent. solution of hydrogen peroxide is added to an equal volume of a 4 per cent. aqueous solution of the sodium salt of 1,2-naphthylenediamine-4-sulphonic acid; this solution is applied with a brush or by any other suitable means. The shades so obtained are said to be very fast to light, washing, and friction.—T. F. B.

Woollen Fabrics Dyed with Indigo; Process for Increasing the Fastness to Friction of —. Farbwerke vorm. Meister, Lucius und Brüning. Fr. Pat. 338,907, July 4, 1903.

ACCORDING to the claim, the fastness to friction of indigo-dyed woollen fabrics is greatly increased by treating the fabric, before dyeing, with solutions of metallic salts.

—T. F. B.

Printing by Pulverisation; Machine for —. E. Marisier. Fr. Pat. 342,484, April 20, 1904.

THE fabric is passed over a hollow cylinder, on which the design to be printed on it is cut. Smaller cylinders, in number equal to the number of colours to be used, are arranged within the main cylinder, in contact with its inner surface, and are provided inside with nozzles through which the colour-mixture is discharged in the form of spray. On the surface of each small cylinder is cut that portion of the design which is to be printed in any particular colour. By causing these small cylinders to rotate at the same circumferential velocity as the main cylinder, having first fixed them so that the designs are in register with the design on the main cylinder, the fabric is printed in the various colours with one treatment.—T. F. B.

Embossed and Printed Tissues; Manufacture of —. A. Lacombe. Fr. Pat. 343,050, May 10, 1904.

THE material is pressed by a pressure plate against another plate engraved with the pattern to be embossed. These plates are suitably heated. If it be required to print colours in relief, the requisite dye is placed in the engraved portions of the pattern plate and is fixed on the material by the pressure and heat.—A. B. S.

Printing with Indigo by the Aid of Hydrosulphites; Process for —. Cie. Paris. Coul. d'Aniline. Addition, dated June 22, 1903, to Fr. Pat. 338,831, May 30, 1903.

SEE Eng. Pat. 13,827 of 1903; this J., 1904, 605.—T. F. B.

VII.—ACIDS, ALKALIS, AND SALTS.

Sulphur Trioxide Catalysis. F. W. Küster. Ges. deutsch. Naturforscher u. Ärzte, Sept. 1904. Z. angew. Chem., 1904, 17, 1512.

IN a patent by Lunge it was claimed that, by the use of iron oxide containing arsenic as contact substance, in

the manufacture of sulphuric anhydride, more satisfactory results were obtained than with pure iron oxide. The author states, however, that the presence of arsenic in the iron oxide has a deleterious influence, both on the yield of sulphur trioxide and the velocity of the reaction; and these views have, in the meantime, been, he considers, practically confirmed by Lunge (this J., 1904, 821). Contrary to Lunge, however, it was found that thorough drying of the reacting gases by means of phosphorus pentoxide caused a considerable decrease in the velocity of the reaction.

With vanadium pentoxide as contact substance, the gases having been dried by concentrated sulphuric acid, 52 per cent. of the sulphur dioxide was converted into sulphuric anhydride in two hours, and 84 per cent. in eight hours.

In the discussion, it was pointed out that the method of preparation of the contact substance has a considerable influence on the velocity of the reaction. The best yields are stated to be obtained by using iron oxide prepared by heating ferrous sulphate at 650° C. for one day.—A. S.

Perochromic Acid. E. H. Riesenfeld. Ges. deutsch. Naturforscher u. Ärzte, Sept., 1904. Z. angew. Chem., 1904, 17, 1514.

THE author has prepared several salts of perchromic acid by the action of a 30 per cent. solution of hydrogen peroxide on chromic acid or its salts. The ammonium salt, $(\text{NH}_4)_2\text{HCrO}_6$, explodes when struck, but the sodium salt is more stable. In aqueous solution, the salts give off oxygen and are reduced to chromates. If the salts are shaken with ether and a little water, some oxygen is evolved, and free perchromic acid (recognised by its characteristic blue colour) is produced. The anhydride of perchromic acid has the composition CrO_6 .—A. S.

Hydrated Alumina. F. Russ. Z. anorg. Chem., 1904, 41, 216—230.

THE author's experiments show that "crystalline" alumina hydrate represents the final stage of a transformation which the freshly-precipitated hydrated alumina invariably undergoes (see this J., 1898, 599; 1900, 1014; 1902, 877). This transformation, slow under ordinary conditions, is accelerated by the presence of hydroxyl ions. The rate of transformation is dependent upon the concentration of hydroxyl ions. The difference in the behaviour of the two modifications to acids and caustic soda solution is one of degree only. The so-called "crystalline" hydrated alumina, when examined under the microscope with a magnification of 500, gave no evidence of crystalline structure. The results of the experiments also give some indications as to the most favourable conditions for the technical manufacture of alumina by Bayer's process (Eng. Pats. 10,093 of 1887 and 5296 of 1892; this J., 1888, 625; 1893, 263; see also this J., 1888, 748; 1893, 925). With a liquor containing alumina and soda in the molecular proportions 1 of Al_2O_3 to 1.24 of Na_2O , the best results are obtainable with a concentration equivalent to about 1.24 sp. gr. measured at 21° C., a yield of 85 per cent. of the alumina present following. By using a highly concentrated solution of caustic soda, it is theoretically possible to obtain a solution of sodium aluminate containing alumina and soda in the molecular proportions 1:1. If such a solution were diluted to a concentration of 3.3 mols. of Na_2O to 100 mols. of water, it would be super-saturated to the extent of 2.9 mols. of Al_2O_3 , which would consequently be gradually deposited on stirring. The yield of alumina in such a case would be the highest obtainable, viz., 85 per cent.—A. S.

Alkali Bromides; Electrolysis of — and Action of Bromine on Alkalis. H. Ketzschmar. Z. Elektrochem., 1904, 10, 789—817.

BY the action of bromine on alkalis, hypobromites are at first always formed, although if equivalent quantities of bromine and alkali are brought in contact, at first a considerable proportion remains uncombined. Free bromine or hypobromous acid reacts with hypobromites to form bromates, $2\text{HBrO} + \text{MBrO} = \text{MBrO}_3 + 2\text{HBr}$, the reaction being quite analogous to the formation of chlorates, but proceeding more rapidly. Solutions of hypobromites of

a concentration above N/10 are about as stable as similar hypochlorite solutions. On electrolysis of neutral bromide solutions, free bromine separates at the anode, and from this hypobromite is formed by reaction with the alkali from the cathode. Hypobromite formation proceeds until a definite concentration is attained, after which only bromate is produced. In strong alkali solutions hypobromite is also first formed up to a definite concentration, but bromate production commences at an earlier stage than in neutral solutions. In acid and neutral solutions the electrolytic bromate formation is due to a secondary reaction between the hypobromite and bromine or hypobromous acid, as shown in the above equation. In strong alkaline solutions, on the other hand, hypobromite is electrolytically oxidised to bromate.—R. S. H.

Molasses; Purification of — by Electrolysis. [Caustic Alkali as By-Product.] L. Gurwitsch. XVI., page 993.

Soda Water-Glass; Analysis of —. P. Heermann. XXIII., page 1000.

Nitrites and Nitrates; Production of — by the Electrolytic Oxidation of Ammonia in presence of Cupric Hydroxide. W. Traube and A. Biltz. XI. A., page 987.

Nickel Salts; Reaction of Potassium Nitrite on —. C. Reichard. XXIII., page 939.

Persulphates; Preparation of —. E. Mueller. XI. A., page 987.

Phosphorus in Solutions; Quantitative Determination of —. A. C. Christomanos. XXIII., page 1000.

ENGLISH PATENTS.

Nitric Acid; Appliances for the Manufacture of —. D. Donnachie, Stevenston, N.B. Eng. Pat. 24,332, Nov. 10, 1903.

THE invention relates to the condensing apparatus for nitric acid vapour. The receiving tank for the vapours from the retort is connected to condensing pipes arranged in undulating series within cooling tanks. The pipes have trapped connections to small pipes which lead back the condensed acid to the tank, where, coming into contact with the hot vapours from the retort, impure vapours are given off, thus purifying the acid.—E. S.

Vitriol [Sulphuric Acid]; Manufacture of —. M. Schwab and H. Greene and Sons, Ltd., London. Eng. Pat. 24,619, Nov. 12, 1903.

THE ordinary lead chamber for the manufacture of sulphuric acid, is supplemented, on its inlet side, by a mixing tower having, preferably, two channels communicating with the chamber, one near the bottom and the other near the top. One of these channels is so disposed with regard to a steam jet or jets, and to the inlet of gases from a Glover tower or from a preceding vitriol chamber, that the pressure in the upper parts of the mixing tower is decreased, and the circulation of gases thus promoted. In long chambers, one or more vertical shafts are arranged, with a steam jet discharging horizontally at the lower end of the shaft towards the outlet end of the chamber.—E. S.

UNITED STATES PATENTS.

Barytes; Process of Bleaching — and Recovering Glauber Salt. W. D. Gilman, Sweetwater, Tenn. U.S. Pat. 770,963, Sept. 27, 1904.

POWDERED barytes ore is heated with a solution of nitre-cake, and after separating the solution, the purified ore is washed with hot water. Impurities are precipitated from the solution and wash-waters by sodium carbonate or hydroxide solution, and the resulting solution of Glauber's salt is crystallised.—E. S.

Mineral Substances [Graphite]; Separation of — by means of the Selective Action of Oil. C. Kendall, Upper Norwood, England. U.S. Pat. 771,075, Sept. 27, 1904.

SEE Eng. Pat. 1300 of 1903; this J., 1904, 115.—T. F. B.

FRENCH PATENTS.

Caustic Soda and Hydrochloric Acid; Manufacture of — from Sodium Salts. C. Girard. Fr. Pat. 338,901, July 1, 1903.

SODIUM sulphate (salt-cake) is prepared as usual, or by passing sulphuric anhydride vapours over damp salt, hydrochloric acid being recovered. The solution of sodium sulphate is then precipitated by barium hydroxide. The caustic lye produced may be evaporated, and the caustic soda fused, or it may be carbonated. Alternatively, crystals of sodium sulphate may be brought into contact with solid hydrated barium hydroxide, to give at once a strong lye, the water of crystallisation sufficing for the reaction. The barium sulphate resulting in either case is heated with carbon, and the sulphide is treated: (a) in saturated hot solution in an electrolytic cell with diaphragm, to obtain barium hydroxide, sulphur, and hydrogen; or (b) a mixture of barium sulphide, carbon, and a metallic oxide, is melted in an electric furnace to obtain a mixture containing barium carbide, which, decomposed by water, gives acetylene and barium hydroxide and an insoluble metallic sulphide. The latter is "calcined" to obtain sulphuric anhydride. Other alternatives in the cycle are given.—E. S.

Sulphuric Acid of High Purity; Process for Economically Producing — in Lead Chambers. H. H. Niedenführ (Installationsbureau f. Chem. Ind.). Fr. Pat. 343,156, May 14, 1904.

SEE Eng. Pat. 1066 of 1904; this J., 1904, 714.—T. F. B.

Salt, Pure; Process for Making — from Crude Rock Salt. H. Tee and H. H. Perkes. Fr. Pat. 342,920, May 6, 1904.

SEE Eng. Pat. 8117 of 1903; this J., 1904, 749.—T. F. B.

ERRATUM.

This Journal, 1904, 934, col. 1, line 4 from bottom, for "hydroxylamine" read "dihydroxylamine."

VIII.—GLASS, POTTERY, ENAMELS.

Glass; Action of certain Gases on — in the neighbourhood of Heated Metals. G. T. Beilby. Brit. Assoc., 1904. Chem. News, 1904, 90, 180—181.

THE author has previously (Brit. Assoc. Report, 1903) described the formation of halos around pieces of metal foil on glass plates, when these are heated in the presence of the products of combustion of coal-gas and air, and also the formation of images of the heated metal on glass plates placed a short distance above the heated metal. Further experiments have shown that the halo and image are produced by decomposition of the glass brought about by the action of sulphuric anhydride, which has been formed by the oxidation of sulphur dioxide, under the catalytic influence of the heated metal. It is suggested that the localisation of the decomposition of the glass is due to ionisation produced by the heated metal, this having the effect of causing the particles of sulphur trioxide produced to be projected from the surface of the metal, some being carried up to the under surface of the covering glass, which they attack, producing the image, whilst the greater number do not reach thus far, but fall back on the surface of the lower glass plate, producing the halo around the metal.—A. S.

Clays; "Rotting" of —. P. Rohland. Z. anorg. Chem., 1904, 41, 325—336.

CLAY-MIXTURES for the manufacture of porcelain are kept for at least three months in a moist atmosphere before being used, in order to increase their plasticity. The changes ("rotting") which the clay undergoes during this process have not yet been satisfactorily explained. Seger (this J., 1892, 162) found that small quantities of caustic soda, sodium carbonate, or sodium silicate diminished or destroyed the plasticity of the mixtures, whilst a slight addition of hydrochloric or acetic acid considerably increased it; he therefore recommended, instead of storage, the addition of a small quantity of acid. The author has

repeated and extended Seger's experiments, and finds that, at first, the plasticity is increased by both hydroxyl and hydrogen ions, but whereas in presence of the latter the increase is permanent, in presence of hydroxyl ions the plasticity again diminishes after a short time, and is finally less than at first. The author considers that all substances which have the power of forming colloidal solutions with water exhibit the property of plasticity to a greater or lesser degree. Clay and porcelain masses contain such colloidal substances, partly of an inorganic and partly of an organic nature, and the combination of these substances in the dissolved condition with the peculiar clay substance, aluminium silicate, $Al_2O_3 \cdot 2SiO_2 \cdot 2H_2O$, may be regarded as the cause of the plasticity of such mixtures. The degree of plasticity may be expressed as $\frac{M}{N}$, or the ratio of the inactive substances M to the active (colloidal) substances N. The increase of plasticity of clay mixtures on storing ("rotting") is due to the formation of acid by the fermentation of the organic matter; the hydrogen ions produced first neutralise the hydroxyl ions present in the solution in contact with the clay, which have an injurious influence on the plasticity, and then the excess of hydrogen ions exercises an accelerating action on the coagulation of the colloidal substances, and consequently on the degree of plasticity of the mixture. The plasticity of clay mixtures can be increased by the addition of colloidal substances, e.g., tannic acid, dextrin, aluminium hydroxide.—A. S.

ENGLISH PATENT.

Ceramic Products; Composition for the Manufacture of —. C. Robin, Saint Genou, France. Eng. Pat. 17,235, Aug. 6, 1904. Under Internat. Conv., Aug. 7, 1903.

SEE Fr. Pat. 334,490 of 1903; this J., 1904, 63.—T. F. B.

UNITED STATES PATENTS.

Cement [for Porcelain, &c.]; Process of Manufacturing Vitreous —, and of Material Designed for the Production of same. P. Steenbock, Deutsch Wilmsdorf, Germany. U.S. Pats. 771,183 and 771,184, Sept. 27, 1904.

SEE Eng. Pat. 15,161 of 1904; this J., 1904, 901.—T. F. B.

FRENCH PATENT.

Glassware; Process of and Apparatus for the Manufacture of —. A. Meister. Fr. Pat. 342,955, April 19, 1904.

THE glass flows directly from the melting furnace into moulds arranged in a casting-chamber heated by the furnace proper in such a way that the glass remains liquid during the casting, the proper shape being then given to the glass by blowing or by moulding. During this operation the outer opening of the moulding chamber is kept closed by the support of the moulds. The table which carries the moulds has a plate so arranged that it closes the chamber when the carrier is withdrawn. To enable the glass to be cast without measuring the quantity needed for each object, a ladle is provided which is capable of being rotated, and which, by means of a gutter above it, receives the glass during the changing of the moulds.

—A. G. L.

IX.—BUILDING MATERIALS, CLAYS, MORTARS AND CEMENTS.

Concrete in Smelting Works. F. I. Havard. X., page 986.

ENGLISH PATENTS.

Brick-Kilns. P. J. Sadler, Oldbury, Worcester. Eng. Pat. 20,028, Sept. 17, 1903.

THE improvements suggested consist of an arrangement of connecting flues and dampers, whereby the waste heat from one kiln may be conveyed into another kiln of the series. Each kiln of the series is provided with a chimney and with

a main connecting flue leading to a main stack or fan for inducing the draught. The heat from the bottom of one kiln is conveyed into the top or over the wicket, or over or under the draught into the side of another kiln.—W. C. H.

Quartz Bricks or Blocks; Fireproof — E. Stöffer, Zürich, Switzerland. Eng. Pat. 11,258, May 16, 1904. Under Internat. Conv., May 16, 1903.

BRICKS are made by subjecting a mixture of quartz and magnesia to the action of steam under pressure and then burning the mass. With many quartz materials it is advantageous to first burn the rock, &c., and chill it with cold water before pulverising. The magnesia bricks are said to expand and bend less than similar bricks made with lime.

—A. G. L.

Adherence of Tiles and the like to Walls; Composition for Effecting the — G. B. Godson, London. Eng. Pat. 17,066, Aug. 4, 1904.

THE composition consists of 40 per cent. of dextrin, 40 per cent. of powdered alum, and 20 per cent. of "adamant" cement, to which a sufficient quantity of gum arabic dissolved in water is added. This mixture is spread on the back of the opal glass or other tiles, and small pebbles, grit, coke, coke breeze, granite chips, &c., are scattered on its surface. As soon as the mixture is dry, the tiles are fixed in position by being pressed against the plaster, &c., previously placed on the wall.—A. G. L.

UNITED STATES PATENTS.

Stones; Process of Colouring Natural Crystalline — E. Klie, Charlottenburg, Germany, Assignor to the Chem.-Techn. Fabr. Dr. Alb. R. W. Brand and Co. G. m. b. H. U.S. Pat. 770,643, Sept. 20, 1904.

THE process of colouring natural crystalline stones containing calcium carbonate consists in drying the stone, placing it in a solution of metallic soaps in volatile oil (such as a metallic oleate in turpentine oil) in the presence of organic acids stronger than the fatty acids of the metallic soaps (such as acetic acid), and heating the said solution. See Eng. Pat. 5594, and Fr. Pat. 338,887 of 1903; this J., 1904, 188, 901.—W. C. H.

Stone; Manufacture of Artificial — from Magnesite. C. Groyen, Bonn, Germany. U.S. Pat. 771,062, Sept. 27, 1904.

SEE Fr. Pat. 334,562 of 1903; this J., 1904, 65.—T. F. B.

Cement; Carborundo — L. E. Müller, Paris. U.S. Pat. 770,780, Sept. 20, 1904.

SEE Fr. Pat. 338,914 of 1903; following these.—T. F. B.

Cement; Manufacture of Acid-Proof and Impermeable — R. Liebold, Weimar, Germany. U.S. Pat. 771,080, Sept. 27, 1904.

SEE Eng. Pat. 4606 of 1904; this J., 1904, 490.—T. F. B.

FRENCH PATENTS.

Refractory Bricks from Quartz; Process for Making — E. Stöffer. Fr. Pat. 343,130, May 13, 1904. Under Internat. Conv., May 16, 1903.

SEE Eng. Pat. 11,258 of 1904; preceding these.—T. F. B.

"Carborundociment" [Protective Facing for Masonry]; Powdered Product called — L. E. Müller. Fr. Pat. 338,914, July 8, 1903.

A COATING used to harden furnace bricks is composed of carborundum, 90 to 60 parts; fireclay, 10 to 40; lime, 0 to 4; sodium or potassium silicate of 47° B., 20 to 50 parts. These materials are mixed intimately, dried, and re-powdered. The product is then mixed to a paste with water. In cases where it is meant to withstand chemical action the coating is composed of carborundum, 50 to 85 parts; calcined magnesia, 5 to 15; and fine sand, 10 to 25. In either case the carborundum may be replaced by other carbides or by metallic silicides and borides. Instead of with water, the mixture may be treated with other liquids, such, e.g., as a solution of magnesium chloride.—A. G. L.

Cement; Manufacture of — B. Grau. Fr. Pat. 343,152, May 14, 1904.

BLAST-FURNACE slag is treated in the fused state with steam, preferably superheated, and the resulting product is reduced to powder.—A. G. L.

X.—METALLURGY.

Temper-Carbon ("Temperkohle") in Iron; Influence of other Elements on Formation of — F. Wüst and P. Schlösser. Stahl u. Eisen, 1904, 24, 1120—1123.

THE authors show that temper-carbon can separate from pure carburised iron without requiring the influence of other elements. The amount produced is a function both of the temperature to which the iron is heated and of the total amount of carbon. The presence of silicon assists the formation of temper-carbon, which then occurs at a lower temperature and from iron with a lower total content of carbon. Manganese and, to a greater extent, sulphur oppose the formation, whereas phosphorus seems to have no influence.—R. S. H.

Molybdenum Carbide; New — H. Moissan and M. K. Hoffmann. Ber., 1904, 37, 3324—3327.

A MIXTURE of molybdenum, aluminium, and petroleum coke is heated in a closely covered carbon crucible in the electric furnace. The product is treated with sodium hydroxide solution to remove aluminium, and with dilute sulphuric acid. After removing from the residue any admixture of graphite, there remains a grey crystalline powder of sp. gr. 8.40 and hardness 6—7, oxidising when heated in air or with potassium chlorate or nitrate, readily attacked by nitric, slowly by other acids, burning spontaneously in fluorine, but attacked much less readily by chlorine or bromine at a red heat. Analysis assigns to it the formula MoC. It is analogous to Williams' tungsten carbide, and is probably present, as a double carbide, in molybdenum steel.—J. T. D.

Magnetic Alloys from Non-magnetic Metals; Production of — R. A. Hadfield. Brit. Assoc., 1904. Chem. News, 1904, 90, 180.

THE author describes a series of magnetic alloys prepared by F. Heusler. It was found that whilst the metals, copper, aluminium, and manganese, and alloys of copper and aluminium, are all non-magnetic, alloys containing the three metals in certain proportions, possess considerable magnetic properties. Although it would appear that the magnetic properties are due to the manganese, yet in alloys containing a fairly constant percentage of manganese, the magnetisability increases with the amount of aluminium up to a maximum, when the proportion of aluminium amounts to about one-half of that of the manganese. This is shown in the following table:—

Alloy containing		H = (Magnetising Force).			
Manganese.	Aluminium.	20.	40.	100.	150.
Per Cent.	Per Cent.				
28	3.8	Unmagnetisable.			
28	5.7	Very slightly magnetisable.			
20	9.6	2220	2670	3200	3470
26	14.6	4500	4850	5380	5550
25	13.8	3580	4075	4645	4900

} B = magnetic induction.

THE author made some experiments with an alloy containing 60 per cent. of copper, 25—27 per cent. of manganese, and 12 per cent. of aluminium. It is very brittle, and cannot be forged either hot or cold. It is feebly magnetic immediately after casting, but becomes non-magnetic when heated to about 170° C. and quenched in cold water. By continued heating at about 80°—150° C., it regains its magnetic properties in an intensified degree. If lead be introduced into the alloy, it becomes more fusible, its transformation-point is lowered, and under suitable heat

treatment, the magnetisability is even increased. Alloys of copper, manganese, and tin also possess magnetic properties; magnetisability is first shown when 10 per cent. of tin is present, whilst the most magnetic alloy is one containing 21–22 per cent. of tin to 30 per cent. of manganese. Alloys of antimony and manganese are also magnetic.

—A. S.

Alloys of Copper and Antimony, and their Recalescence.

A. A. Baikoff. J. Russ. Phys. Chem. Soc., 1904, 36, 111–165. (See also this J., 1903, 744.)

The author has prepared melting-point curves and tables for the alloys of copper and antimony, and also their cooling curves. The latter show that these alloys exhibit the phenomenon of recalescence. Copper and antimony form two compounds, SbCu_2 and SbCu_3 . The violet alloy, SbCu_2 , melts and decomposes at 516°C , and can be prepared by melting the alloy SbCu_3 and antimony together in such proportions that solidification begins at a temperature below 586°C ; mixtures of the two metals which commence to solidify at higher temperatures than 586°C , deposit only the alloy SbCu_3 , which melts at 681°C . These results are in accord with those given by a study of the other physical properties of these alloys—hardness, expansion, and E.M.F. in galvanic elements. The alloy SbCu_3 exists in two modifications: (1) the α -form, stable at temperatures below 407°C , and (2) the β -form, stable only at higher temperatures. All mixtures of the two metals containing from 53.5 to 61 per cent. of copper, and consisting of mixed crystals of antimony and the compound SbCu_3 , undergo, on cooling, two distinct changes: (1) polymorphic transformation of the β -form of the compound SbCu_3 into the α -modification, and (2) separation of the compound SbCu_3 . The micro-structure of the different alloys confirms the above conclusions.—T. H. P.

Passivity of Metals. W. Muthmann and F. Fraunberger. Sitzungsber. Bayr. Akad. Wiss., 1904, 201–241. Chem. Centr., 1904, 2, 972–974.

A LARGE number of experiments have been carried out with different metals, and it was found that, besides iron, chromium, nickel and cobalt, vanadium, molybdenum, tungsten, and ruthenium are capable of being rendered passive. The results are given of a large number of potential measurements made in N/1 potassium chloride solution against a normal electrode (mercury, mercurous chloride, N/1 potassium chloride solution) with the metals after treatment with various reagents and after filing, &c. The authors consider that the passive metals contain dissolved oxygen, and that the degree of passivity is dependent upon the amount and the pressure of the dissolved oxygen. The potential of a passive metal can thus be regarded as an alloy-potential, which in certain cases can approach very near that of pure oxygen. (Compare this J., 1903, 637.)—A. S.

Concrete in Smelting Works. F. I. Havard. Amer. Inst. Mining Eng., Sept. 1904. Eng. and Mining J., 1904, 78, 460.

THE author describes the advantages and disadvantages which have been observed with the use of concrete (1 of cement to 7 of sand and “jig-tailings”) flues and stack at a lead- and silver-smelting works. The cost of construction was about 0.11 dol. per sq. ft. *Effect of Heat:* Cracks were caused by temperatures above 100°C . Neutral furnace-gases at 120°C . caused so much damage by formation of cracks, that after two years, the stack, constructed of pipes 4 ins. thick, required repairing throughout. *Effect of Flue-Gases and Moisture:* In cases where the flue was protected on the outside by a wooden or tiled roof, and inside by an acid-proof paint, composed of water-glass and asbestos, the concrete was not appreciably damaged. Where the protective covering, both inside and outside, was of asphalt only, the concrete was badly corroded and cracked at the end of three years. Concrete unprotected from both atmospheric influences on the outside, and furnace-gases on the inside, was quite destroyed at the end of three years. The presence of an excessive amount of moisture in the furnace-gases had a very injurious influence.—A. S.

Lead [in Brass, Bronze, &c.]; Volumetric Determination of —. E. J. Ericson. XXIII., page 1000.

ENGLISH PATENTS.

Incorrodible Material [Iron-Hydrogen Alloy], and Method of its Production. G. W. Gesner. Eng. Pat. 16,029, July 19, 1904. XIII. A., page 989.

Steel and Armour Plates; Process of Treating —. E. Engels, Düsseldorf, Germany. Eng. Pat. 16,419, July 25, 1904. Under Internat. Conv., March 21, 1904.

THE steel is heated in presence of oxygen, or of substances that yield oxygen, such as manganese dioxide, and, whilst still red hot, is plunged into molten lead (or other cooling bath); when withdrawn it may be rolled or pressed, and be then cemented on the side to be hardened. It is then hardened in oil or the like, and is annealed at a temperature lower than that used in cementing. The process may be varied according to circumstances, and the indicated special treatment may be used with or without combination with a cementation process. See also Eng. Pats. 25,932 of 1903 and 1842 of 1904; this J., 1904, 118 and 374.—E. S.

Ore-roasting and like Furnaces. H. H. Lake, London. From I. Sanfilippo, Casteltermini, Sicily. Eng. Pat. 19,353, Sept. 8, 1903.

SEE Fr. Pat. 334,444 of 1903; this J., 1904, 67.—T. F. B.

Copper, Silver, Lead, Mercury, and all other Metals adapted to be Precipitated from an Acid Solution by Means of Sulphuretted Hydrogen; Process for Separating from their Ores —. P. Weiller, Vienna, and A. Weiller, Trieste, Austria. Eng. Pat. 7309, March 26, 1904.

SEE Addition, of April 7, 1904, to Fr. Pat. 336,989 of 1903; this J., 1904, 903.—T. F. B.

Alloy; New Metallic —. Firm of Routin and Mourraile, Lyons, France. Eng. Pat. 9584, April 26, 1904. Under Internat. Conv., May 25, 1903.

SEE Fr. Pat. 332,605 of 1903; this J., 1903, 1247.—T. F. B.

Vanadium; Manufacture of Metallic — from its Ores or any other Compounds of Vanadium. P. Auchinachie, Wrexham, Wales. Eng. Pat. 12,727, June 6, 1904.

THE ore or other compound of vanadium is strongly heated for about two hours with, preferably, concentrated sulphuric acid, to which a small proportion of sodium nitrate is added. The cooled solution is diluted with water, and after settling, the clear blue solution of vanadium sulphate is electrolysed, using iron electrodes, vanadium oxide being deposited; or the vanadium oxide may be separated by chemical means; and in either case it is mixed with carbon and heated to about 2000°C . in an electric furnace. The vanadium is obtained from the residual melted mass by grinding under steel rollers and washing the carbon away by water.—E. S.

Solder for Aluminium or Aluminium Alloys. R. F. y Pelletier and E. S. y Semprun, Madrid. Eng. Pat. 13,328, June 13, 1904.

AN alloy of silver, aluminium, and tin, in stated proportions, is melted in a covered crucible, and immediately before solidification, about 10 per cent. of its weight of phosphorus is added; this alloy is referred to as “metal F.” “Metal S” is obtained by adding sulphur in small pieces to melted zinc, and casting the mass in “rails.” “Metal FS” is obtained by fusing 85 parts of “metal F” with 15 parts of “metal S.” The solder for aluminium or its alloys is obtained by melting and adding together, in the order named, 10 parts each of “metal FS” and aluminium, 80 parts of zinc, and 320 parts of tin, all by weight. See also Eng. Pat. 7016 of 1903; this J., 1903, 801.—E. S.

UNITED STATES PATENTS.

Aluminium; Manufacture of —. W. Rübel, Assignor to N. Bernstein, Berlin. U.S. Pat. 770,389, Sept. 20, 1904.

SEE Fr. Pat. 322,353 of 1903; this J., 1903, 369.—T. F. B.

Blast Furnaces; Cooling Device for —. L. Keyling, Berlin. U.S. Pat. 770,910, Sept. 27, 1904.

SEE Eng. Pat. 16,646 of 1902; this J., 1903, 800.—T. F. B.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(A.)—ELECTRO-CHEMISTRY.

Nitrites and Nitrates; Production of — by the Electrolytic Oxidation of Ammonia in presence of Cupric Hydroxide. W. Traube and A. Biltz. Ber., 1904, 37, 3130—3138.

A MIXTURE of a 20 per cent. solution of sodium hydroxide and a 10 per cent. solution of ammonia containing dissolved cupric hydroxide equal in weight to about one-tenth of the ammonia present was used as the anode liquid of an electrolytic cell, and a 20 per cent. solution of sodium hydroxide solution, in an inner porous cell, as a cathode liquid. The currents used were 5, 10, and 15 amperes, and the electrodes thin sheet iron, the anode surface being from 15 to 25 sq. cm. per ampère. Sodium nitrite was produced during five to seven hours of electrolysis, up to quantities of 20—30 grms.; current yield, 75—90 per cent. The maximum strength of solution thus obtained was about 7 per cent.; but by starting with a solution already containing this amount of nitrite, the strength was increased to nearly 10 per cent. If the current be continued long enough, the amount of nitrite ceases to increase, and then diminishes, till finally it entirely disappears. Examination of the liquid shows that the nitrite has been converted into nitrate. The yield of nitrate so obtained was about 75 per cent. of that corresponding in theory with the current. Corresponding experiments have shown that the nitrites and nitrates of potassium and of barium are also obtainable in this way, though in neither case have as good yields been yet obtained as with the sodium salts.—J. T. D.

Persulphates; Preparation of —. E. Müller. Z. Elektrochem., 1904, 10, 776—781.

THE production of potassium or sodium persulphate by the electrolysis of acid sulphates is greatly aided by the presence of the fluorine ion. Thus, in 125 c.c. of a N/2.3 solution of potassium bisulphate, by substituting 20 c.c. of N/20 hydrofluoric acid for added free sulphuric acid, the yield of persulphate was raised from about 50 per cent. to about 75 per cent. Paraffined glass vessels were used. If a crust of persulphate be allowed to form on the anode, the beneficial effect of the hydrofluoric acid ceases.—W. A. C.

Potassium Cyanate; Electrolytic Preparation of —. E. Paternò and E. Pannain. Gaz. chim. ital., 1904, 34, [2], 152—155. Chem. Centr., 1904, 2, 982.

THE authors find that the best yields of potassium cyanate are obtained by electrolysis of a solution of potassium cyanide containing 4—6 gm.-mols. per litre, using a rotating anode, an E.M.F. of 4—6 volts, and an anodic current-density of 1—4 amperes per sq. dm. Under these conditions nearly the whole of the cyanide can be converted into cyanate, which partly crystallises out during the electrolysis. For example, from 72 grms. of potassium cyanide, with an E.M.F. of 4.5 volts and a current-density of 1.5—2.5 amperes per sq. dm., 32 grms. of cyanate separated during electrolysis, whilst a further 42 grms. were recovered from the solution by evaporation, thus giving a total yield of 90 per cent.—A. S.

Nitrotoluene; Electrolytic Reduction of —. W. Löb and J. Schmitt. Z. Elektrochem., 1904, 10, 756—764.

FOR the production of toluidine, the following cathode materials were tried, and are arranged in ascending order of efficiency: nickel, zinc, copper, and copper with the addition of powdered copper to the electrolyte. The reduction of *p*-nitrotoluene is decidedly easier than that of *m*-nitrotoluene. The electrolytic preparation of *m*-azoxytoluene with nickel cathodes in a 2 per cent. solution of

caustic soda is recommended as a laboratory method, also the preparation of toluidines with copper cathodes and powdered copper.—W. A. C.

Electrolysis of Alkali Bromides, and Action of Bromine on Alkalis. H. Ketzschmar. VII., page 983.

Sugar Industry; Application of Electrolysis in the —. L. Gurwitsch. XVI., page 993.

Molasses; Purification of — by Electrolysis. L. Gurwitsch. XVI., page 993.

ENGLISH PATENT.

Electric Energy; Production of — by the Utilisation of the Chemical Energy of any suitable Combustible, without the Employment of Thermal Engines. H. Tourneur. Paris. Eng. Pat. 12,188, May 28, 1904. Under Internat. Conv., June 11, 1903.

SEE Fr. Pat. 332,982 of 1903; this J., 1903, 1298.—T. F. B.

UNITED STATES PATENT.

Incandescent Electric Material. A. Voelker, Berlin. Assignor to Soc. Anon. Ind. Verrière et ses Dérivés à Bruxelles. U.S. Pat. 770,991, Sept. 27, 1904.

"CARBON" is ground into grains of from 1 to 7 mm. in size, and this material is then divided into groups, the first of which contains only grains of 1 mm. in size, the second only 2 mm., and so on, each group being afterwards graduated by the addition of graphite or of silicates, depending upon whether the conductivity of the group is to be increased or decreased.—W. C. H.

FRENCH PATENTS.

Reducing Organic Substances by means of Titanium Compounds; Electrolytic Process for —. Farbwerke vorm. Meister, Lucius und Brüning. Fr. Pat. 338,934, July 20, 1903.

SEE U.S. Pat. 742,797 of 1903; this J., 1903, 1355.—T. F. B.

Electrolytic Apparatus. H. S. Blackmore and E. A. Byrnes. Fr. Pat. 343,047, May 10, 1904.

SEE U.S. Pats. 759,798 and 759,799 of 1904; this J., 1904, 613.—T. F. B.

Gaseous Medium from Air; [Electrolytic] Process for Extracting a —. J. N. Alsop. Fr. Pat. 343,129, May 13, 1904. Under Internat. Conv., May 29, 1903.

SEE U.S. Pats. 759,883 and 758,884 of 1904; this J., 1904, 611 and 612.—T. F. B.

(B.)—ELECTRO-METALLURGY.

Iron; Electrolytic —. A. Skrabal. Z. Elektrochem., 1904, 10, 749—752.

IRON may be deposited electrolytically in two modifications. The first, from ferrous solutions at low current densities with iron anodes, is white, very hard, and brittle, and resists the action of corrosive liquids to a striking extent. On igniting it, hydrogen is expelled, whilst the metal becomes quite malleable. On the other hand, it gives up hydrogen on heating to 70° C. without losing its brittleness, and can then be recharged with hydrogen electrolytically; whilst after ignition it can neither be charged with hydrogen nor brought into the hard, brittle condition again. The second variety of electrolytic iron is produced from complex ions of bivalent iron at high densities with platinum anodes, and is grey, amorphous, and not very compact. Though not free from oxide, it contains more hydrogen than the first variety. It is not only very readily soluble in acids, but is capable of decomposing water. The author regards both varieties as solutions of more or less hydrogen in γ -iron, changing on ignition into the stable α -iron.

—W. A. C.

Metals capable of Decomposing Water; Electrolytic Separation of — from Solutions of their Salts. A. Siemens. Z. anorg. Chem., 1904, 41, 249—275.

MAGNESIUM can be separated in the metallic condition, together with nickel, from aqueous solutions containing salts of the two metals, provided the concentration of the magnesium salt be sufficiently high. The following were the most satisfactory results:—

Concentration.		Current Density.	Temperature.	Percentage of Magnesium in the deposited Metal.
Nickel Sulphate.	Magnesium Sulphate.			
N/1	8N	Amp. per sq. decm.	° C.	
4N	8N	5	90	2.12
		1	29	2.63

The deposits containing magnesium differ from those of pure nickel in being compact and adherent, and showing no tendency to "strip" as the latter do. The nickel-magnesium alloy adheres firmly to iron, whereas in electroplating iron with nickel it is thought necessary to deposit an intermediate layer of copper, in order to obtain an adherent coating of nickel. Magnesium can also be deposited in a similar manner with cobalt, and to a lesser degree with iron, but only in traces with zinc. Aluminium and the alkaline-earth metals cannot be deposited simultaneously with heavy metals from aqueous solutions. The alkali metals can be deposited in very small amounts with nickel and tin, but not with iron and silver. In all cases the deposits are not definite compounds of the two metals, but are solid solutions of the light metal in the heavy one. Deposits of a heavy metal containing a dissolved light metal are characterised by having a distinctly higher potential than deposits of the heavy metal in a pure condition. Alkali and alkaline-earth metals can, under certain conditions, be deposited electrolytically from solutions of their salts in acetone; on the other hand, magnesium, aluminium, and beryllium cannot be deposited in this way.—A. S.

Copper; Electrolytic Assay of —. G. L. Heath. XXIII., page 1001.

ENGLISH PATENT.

Electric Furnace for Converting Pig Iron into Steel. G. Gin, Paris. Eng. Pat. 8216, April 9, 1904. Under Internat. Conv., June 4, 1903.

SEE Fr. Pat. 342,101 of 1904; this J., 1904, 904.—T. F. B.

FRENCH PATENTS.

Electric Furnace; Arrangement of —. A. Voelker. Fr. Pat. 343,094, May 13, 1904.

THE crucible or object to be heated, placed centrally in the cavity of the furnace, is surrounded by a packing consisting of pieces of charcoal, varying in diameter from 1 to 7 mm., arranged in classified layers or groups, whereby on passage of the current the heating is regulated by the position of the strata, such heating being in part on the resistance, and in part on the arc system. The conductivity of the packing medium may be further modified by addition, in places, of graphite or of silicates. (See U.S. Pat. 770,991 of 1904, XI. A., page 987.)—E. S.

Zinc; Process for the Direct Extraction of [in Electric Furnace] — from its Ores. A. Rodriguez Bruna. Fr. Pat. 343,114, April 30, 1904.

ZINC ores are mixed with carbon, and the mixture is heated, under pressure, in an electric furnace. It is stated that the zinc may be thus obtained in the melted state, instead of as vapour. When blende is thus treated, certain by-products are obtained, including carbon bisulphide, which may be burnt with the other gases to produce sulphur dioxide, &c. —E. S.

XII.—FATTY OILS, FATS, WAXES, AND SOAP.

Fats; Effect of Exposure to Light on —. M. Winckel. Ges. deutsch. Naturforscher u. Ärzte. Z. angew. Chem., 1904, 17, 1524. Chem.-Zeit., 1904, 28, 981—932.

H. KREIS found that fats which had been exposed to sunlight gave a red coloration with a mixture of phloroglucinol and hydrochloric acid. The author examined a number of fats and oils, and found that the fresh substances did not give the reaction, but that they did after being exposed to direct sunlight for one hour. On keeping samples of lard (1) In the air exposed to direct sunlight, (2) Exposed to sunlight *in vacuo*, (3) Exposed to the air in the dark, and (4) *In vacuo* in the dark; and subsequently testing them, it was found that samples (1) and (2) gave the phloroglucinol reaction after half an hour and several hours respectively, whilst samples (3) and (4) became rancid, but did not give the colour reaction. The colour reaction was found to be caused by free oleic acid.—A. S.

Saponification; Theory of —. R. Fanto. Moratsh. Chem., 1904, 25, 919—928.

THE author opposes the theory of Geitel and of Lewkowitzsch (this J., 1898, 1007; 1899, 1031; 1900, 254; 1903, 596) on the ground that he was unable to detect mono- or diglycerides in the products of the partial saponification of fats with aqueous solutions of potassium hydroxide. In his experiments with olive oil, ox tallow, tristearin, and (impure) triolein, the fat was heated with the potassium hydroxide in a cylindrical flask immersed in boiling water for three or six hours, whilst the contents were kept in continual motion by means of a stirring device worked by a turbine. The products of the reaction were then decomposed with acetic acid, extracted with ether, and analysed, the glycerol and the acid value being determined, and from the increase on the acid value of the original fat, the amount of potassium hydroxide that had entered into the reaction could be calculated. From the results obtained the author considers himself justified in stating, with reference to the saponification of fat with potassium hydroxide in homogeneous solution, (1) That the presence of di- and mono-acyl hydrins cannot be detected; (2) That in homogeneous solution the saponification is practically quadrimolecular. (See also this J., 1898, 673; 1904, 550, 905.)

—C. A. M.

Fatty Oils; Colour Reactions of —. H. Kreis. XXIII., page 1001.

Wool-Fat Oleins [Detection of Mineral and Rosin Oils in —]. J. Marcussou. XXIII., page 1001.

ENGLISH PATENT.

Fat-extracting Solvents; Process for the Removal of — from Materials. E. Bergmann, Ohlan, Germany. Eng. Pat. 21,667, Oct. 8, 1903.

SEE Fr. Pat. 335,964 of 1903; this J., 1904, 328.—T. F. B.

FRENCH PATENT.

Candles, Lamp Oils, Edible Fats, Unguents or Pomades, Soaps, &c.; Manufacture of —. C. Dreymann. Fr. Pat. 343,158, May 14, 1904.

THE following derivatives of fatty acids are claimed for these purposes:—(1) Esters, (2) Condensation products of esters with other organic compounds, (3) Amides, (4) Products of the limited oxidation of unsaturated fatty acids, either alone or mixed with fatty acids of a higher series or with other fatty bodies. Claim is also made for a process of mixing sulpholeic acids prepared in the usual way with an oxide, hydroxide, or other suitable substance (e.g., calcium or magnesium oxides) before the distillation. This addition is stated to reduce the loss of solid material during

the distillation. Loss by decomposition may also be prevented by converting the fatty acids into esters, which are distilled and then saponified in an autoclave. A method (claimed) of obtaining a larger yield of a harder soap consists in raising the saponification value of an olein by means of regulated oxidation, and saponifying the product.

—C. A. M.

ERRATA.

This Journal, page 942, col. 2 :—

1. 32 from top, insert after "into," the words "one of."
1. 37 from top, insert after "chloride," the following :—"previously ground like the hard soap, in others of the series of disintegrators already referred to."
1. 39 delete the word "(crystals)" and substitute "26" for "69."
1. 40 insert before "anhydrous," the words "combined water, 43 parts ;"

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(A).—PIGMENTS, PAINTS.

Molasses; Purification of — by Electrolysis. [Pigment as By-Product.] L. Gurwitsch. XVI., page 993.

ENGLISH PATENT.

Incorrodible Material [Paint], and Method of its Production. G. W. Gesner, New York. Eng. Pat. 16,029, July 19, 1904.

An alloy of iron and hydrogen, containing 0.13 per cent. of the latter element, is claimed to possess "remarkable qualities in resisting corrosive influences." It is produced by exposing iron, or an iron ore, to an atmosphere of hydrogen at a temperature of about 1800° F., or by forcing hydrogen through molten iron. The product is pulverised by stamping and grinding. For use as a paint it is mixed with linseed oil or other vehicle. If the powder is strongly compressed and then heated to about 2000° F. for about two hours, it coheres, without fusion, into solid masses."

—M. J. S.

UNITED STATES PATENTS.

Lake [from Azo Dyestuff]; Red —. W. Herzberg and O. Siebert, Assignors to Act.-Ges. f. Anilinfabrikation, Berlin. U.S. Pat. 770,430, Sept. 20, 1904.

SEE Fr. Pat. 329,037 of 1903; this J., 1903, 992.—T. F. B.

White Lead; Manufacture of —. J. Oettli, Lausanne, Assignor to Syndicat pour l'Exploitation des Inventions du Prof. Oettli, Berne, Switzerland. U.S. Pat. 771,024, Sept. 27, 1904.

SEE Fr. Pat. 328,490 of 1903; this J., 1903, 1096.—T. F. B.

Zinc White; Manufacture of —. J. Oettli, Lausanne, Assignor to Syndicat pour l'Exploitation des Inventions du Prof. Oettli, Berne, Switzerland. U.S. Pat. 771,025, Sept. 27, 1904.

SEE Fr. Pat. 328,491 of 1903; this J., 1903, 1097.—T. F. B.

FRENCH PATENTS.

Medium for Oil Colours which do not contain Lead; Process for Making a —. J. E. Kollinger. Fr. Pat. 338,913, July 8, 1903.

OIL colours, not containing lead, are ground up with a medium consisting of vegetable oil, 20 to 50 parts; rosin soap, 15 to 40 parts; and turpentine, 0.5 to 4 parts. Colours prepared thus are stated to have great covering power, and to be perfectly resistant to heat; it is also said that they are not decolorised by light, alkalis, or sulphuretted hydrogen.

—T. F. B.

Lakes [from Azo Dyestuffs]; Production of —. Badische Anilin und Soda Fabrik. Fr. Pat. 338,928, July 13, 1903.

SEE Eng. Pat. 15,493 of 1903; this J., 1904, 670.—T. F. B.

Lakes very Fast to Water; Production of —. Badische Anilin und Soda Fabrik. Fr. Pat. 342,903, May 5, 1904. Under Internat. Conv., March 8, 1904.

LAKES very fast to water are produced by precipitating dyestuffs on a substratum of a basic aluminium salt. The basic chloride, nitrate, and thiocyanate are the most suitable for the purpose; basic aluminium sulphates do not lend themselves very well to such treatment. The lakes may be prepared by adding a determined quantity of hydrochloric or nitric acid to a suspension of alumina in a solution of the dyestuff, or by adding sufficient alkali to precipitate the dyestuff on an aluminium salt which is not sufficiently basic. It is often advantageous to heat the mixture during the precipitation. The following example is given for preparing a fast yellow lake: 200 kilos. of a 4 per cent. alumina paste are incorporated with a solution of 1 kilo. of Naphthol Yellow S, and the lake is precipitated by the addition of a solution of 0.8 kilo. of aluminium chloride ($\text{AlCl}_3, 6\text{H}_2\text{O}$).—T. F. B.

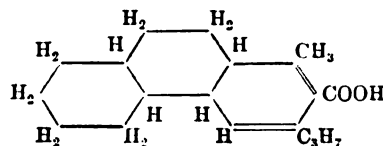
Colours [Pigments]; Manufacture of Oil —. M. Hérison. Fr. Pat. 342,550, April 22, 1904.

THE basis of this pigment is barium silicate, to which are added hydrated silica, infusorial earth, kaolin, zinc oxide, and alumina in stated proportions.—T. F. B.

(B).—RESINS, VARNISHES.

Resin Acids of the Coniferae. I. Constitution of Abietic Acid. T. H. Easterfield and G. Bagley. Chem. Soc. Trans., 1904, 85, 1238—1249.

WHEN colophony is distilled under reduced pressure, abietic (sylvic) acid forms the major part of the distillate, no isosylvic anhydride being produced; the same result was obtained by distillation in superheated steam. When the latter process was carried out on a large scale, in a stearin still, the resin acids were found to condense almost entirely in the first two coils, the abietene and other decomposition products being found mostly in the cooler coils. The decomposition of abietic acid to abietene occurs to a much greater extent when distillation is carried out in an iron still than in a glass retort; thus abietic acid can be redistilled from a glass vessel under 100 mm. pressure, while from an iron still, considerable decomposition occurs even under 20 mm. pressure. By distillation under ordinary pressure, abietic acid is decomposed into abietene and oxides of carbon in such proportions as make it certain that abietic acid is abietene carboxylic acid. On distillation with small quantities of sulphur under ordinary pressure, or with large amounts under reduced pressure, retene is produced; from this and from the empirical formulae of the two compounds, it follows that abietene is decahydroretene. Kelbe (Ber., 1884, 17, 1157) has shown that resin spirit is rich in *m*-cymene; hence it is highly probable that abietic acid is decahydrodimethylisopropylphenanthrene-carboxylic acid of the constitution —



By analogy, pimaric acid is most probably a monomethyl derivative of abietic acid. Limonic acid and podocarpic acid are considered also to be octahydrohydroxymethyl- and octahydrohydroxymethylphenanthrene-carboxylic acid respectively.—T. F. B.

Nan-ta-Yok or Burmese Storax; Properties of —
D. Hooper. Agric. Ledger, 1904, 115—122.

Source.—This balsam, which has long been used in Burma as incense and for medicinal purposes, is produced by *Altingia excelsa* (Noronha), a large tree (150 to 180 feet high) growing in the forests of the Indian Archipelago, Burma, Assam, and Bhutan, and especially in the Tenasserim province of Burma. It is also found in China, Java, Cochin China, New Guinea, and the Sunda Archipelago. Three samples of resinous balsam from Java examined by Tschirch and van Itallie (this J., 1901, 1122) were said to be the products of two species of *Altingia*, but in Greshoff's opinion both trees were *Altingia excelsa*. The two aromatic exudations from South Tenasserim examined by the author had the following properties:—

Soft White Crystalline Balsam.—This resembled honey when fresh, but after two years crystallised, and became white, and had a fragrant odour of styrol. It melted at 41° C., and when heated on the water-bath lost 7.65 per cent. in weight, the volatile substances being chiefly essential oils. It gave the following values:—Acid value, 24.96; saponification value, 199.35; and iodine value, 57.3. About half the balsam consisted of an ester of cinnamic acid, the amount of the latter separated being 37 per cent. calculated on the original balsam.

Dark Brown Solid Balsam.—This consisted of resinous masses, which yielded a brown powder with an aromatic odour in which that of cinnamon predominated. After clarification with alcohol two samples gave the following results:—Resins, 53.72 and 54.70; organic impurities, 19.09 and 28.05; inorganic impurities, 22.24 and 10.67; and volatile oil and loss, 4.95 and 6.58 per cent. The purified resin (m. pt. 68° C.) was clear, of an amber colour, and had the fragrant odour of the crude balsam. It was soluble in chloroform, carbon bisulphide, and benzene, partially soluble in acetic ether, and slightly soluble in petroleum spirit.

	Acid Value.	Saponification Value.	Iodine Value.
Crude resins	52.48	130.10	41.07
Pure resins	76.80	130.44	51.68

The brown balsam contained a trace of free cinnamic acid, and 9.7 per cent. of that acid in the form of an ester. The author's conclusion is that the white balsam is valuable as a perfume and as a source of cinnamic acid, whilst the brown balsam is of value as a perfume and as incense. Both possess a sweeter aroma than genuine storax, and when heated with sulphuric acid and potassium bichromate both evolve an odour of benzaldehyde. If examined by Dieterich's method (this J., 1898, 807) the brown resinous balsam cannot be regarded as true storax, whilst the white balsam only agrees with that resin in the saponification value. Hence the author's results confirm the statement of Tschirch and van Itallie (*loc. cit.*) that Nantayok resin differs in constitution from the genuine storax of Asia Minor.—C. A. M.

ENGLISH PATENTS.

Gums and Resins; Impls. in and Apparatus for the Treatment of Products containing —, and for the Separation and Obtainment of the Gums and Resins therefrom. J. Y. Johnson, London. From A. Foelsing, Offenbach-on-Maine, Germany. Eng. Pat. 21,020, Sept. 30, 1903.

The apparatus consists essentially of four parts: a closed extractor, in which the substance is exposed to the action of the hot solvent; a boiler, in which the solution so obtained is distilled for the recovery of the solvent and the extracted matter; a cooled coil, in which the vapour of the solvent is re-condensed; and a reservoir, intermediate between the condenser and the extractor, for the storage of the solvent. The special claim is for the use of selective solvents, by which resins can be extracted from substances containing

rubber also, the substance to be treated being first rolled out into thin sheets and dried before placing it in the extractor.—M. J. S.

Varnishes; Manufacture of — by the Direct Solution of Gums without Previous Fusion. A. Tixier, Billancourt, Seine, and L. Rambaud, Paris. Eng. Pat. 17,133, Aug. 6, 1903.

SEE Fr. Pat. 334,430 of 1903; this J., 1904, 69.—T. F. B.

UNITED STATES PATENT.

Wood; Method of Treating [Distilling] — for the Production of Paper Pulp, Turpentine, &c. W. Hoskins, Lagrange, Ill. U.S. Pat. 770,463, Sept. 20, 1904.

WOOD is subjected, in a digester, to the direct action of steam, at a temperature lower than that which would cause the decomposition of the resins; the "volatilisable condensable constituents" are then separated from the wood, the resinous constituents melted out, and the residual fibrous mass is treated with caustic soda-lye or other substance to reduce the fibre to pulp, which is suitable for paper-making. The alkaline liquor is evaporated and the residue distilled, to produce therefrom "oily and tarry products." The residue of this distillation is finally extracted with water to recover the alkali or other reagent employed.—T. F. B.

(C.)—INDIA-RUBBER, &c.

Latex of Castilleja Elastica; Cause of Coagulation of —. A. W. K. de Jong and W. R. Tromp de Haas. Ber. 1904, 37, 3301—3305.

THREE different latexes, containing respectively 3.5, 3.4, and 3.65 grms. of rubber per 10 c.c., were treated with increasing amounts of various coagulating agents, well shaken, allowed to stand, thrown into water, and the coagulum collected. Alcohol and acetone, employed as coagulating agents, were found to give yields increasing proportionally to the amount of coagulant used, up to a certain maximum, and then diminishing. (The maximum referred to is attained with $\frac{1}{2}$ vol. of alcohol and 1 vol. of acetone.) Glacial acetic acid coagulated the rubber in direct proportion with the amount added, 2 vols. coagulating the whole, and larger quantities causing no diminution. In the presence of water, however, the yields of rubber were smaller, but in the same general proportion with the different coagulants; in no case was the whole of the rubber coagulated. The latex was then purified by washing with water until 10 c.c. contained 0.65 gm. of rubber. Alcohol ($\frac{1}{2}$ vol.), acetone ($\frac{1}{2}$ vol.), and acetic acid, strong or dilute ($\frac{1}{2}$ vol.), now caused total coagulation, smaller quantities than those stated giving proportionally lower amounts, and excess having no adverse influence. The phenomenon of maximal point in the case of alcohol and acetone thus appeared to be due to constituents in the latex removable by washing. Pasteurisation of the latex almost destroyed the coagulating power of alcohol, much reduced that of acetone, but had no effect on that of glacial acetic acid. The filtrates from the fresh latex gave a precipitate with alcohol ($\frac{1}{2}$ vol.) or acetone ($\frac{1}{2}$ vol.), but little with glacial acetic acid. Addition of these filtrates to the washed latex restored the properties of the unwashed latex, i.e., partial coagulation. It seemed, then, that alcohol and acetone precipitated soluble constituents that hinder coagulation. Again, fresh latex is not coagulated by heat, but washed latex is. Addition of these precipitates to washed latex also inhibited its coagulation by heat. Attempts were made to knead together mechanically, in a mass, finely divided solid rubber placed in various fluids. This was accomplished with alcohol, acetone, and glacial acetic acid, but failed with tannin, formaldehyde, alkalis, and hydrochloric acid. The first three liquids are known to be solvents for resin, and determinations of the amount of resin in the coagulum from washed latex, by Van Romburgh and Tromp de Haas' method (Bull. de l'Institut Bot. de Buitenzorg, 15), showed amounts ranging from 9 to 12 per cent.—R. L. J.

Rubber; Apparatus for [Coagulation of — by] Smoking — J. B. Cardoso Danin. *India-Rubber World*, 1904, 30, 413.

RUBBER coagulated by "smoking" is stated to possess a special value, and in order to make the process less dependent upon the skill of the native rubber collector, the author recommends the adoption of the following simple apparatus. The latex is fed into a rotating cylinder mounted on friction rollers, and the smoke is introduced by a side tube.—A. S.

Rubbers and Rubber Vines from the East Africa Protectorate. Bull. Imp. Inst. (Suppl. to Bd. of Trade J.), 1904, 2, 153—156.

Rubber from Takaungu.—Three specimens of a rubber-vine which occurs in considerable quantities near Takaungu, and two samples of the rubber obtained from it, labelled "Sokoki" and "Mtoni" respectively, were examined. The vine was identified as *Landolphia Kirkii*. The "Sokoki" rubber was not sticky, and exhibited very good physical properties. It contained: moisture, 11.7; caoutchouc, 78.9; resin, 6.8; dirt, 2.6; ash (included in dirt), 0.87 per cent. The "Mtoni" rubber was almost identical in appearance and character with the "Sokoki" rubber. It contained: moisture, 9.1; caoutchouc, 78.2; resin, 4.1;

dirt, 8.6; ash (included in dirt), 8.5 per cent. Both rubbers were valued at 3s. 2d.—3s. 3d. per lb.

Rubber from Kamasia Hills, Naivasha Province.—The vine was identified as *L. Kirkii*. The sample of rubber gave the following results on analysis:—Moisture, 10.8; caoutchouc, 68.3; resin, 11.5; dirt, 9.4; ash (included in dirt), 1.05 per cent. The rubber was not sticky, and exhibited fair elasticity and great tenacity. If properly prepared, it would probably be equal in value to the rubber from Takaungu.

Rubber from Rabai.—The vine was a species of *Landolphia*. The sample of rubber contained: moisture, 4.3; caoutchouc, 84.1; resin, 4.5; dirt, 7.1; ash (included in dirt), 3.62 per cent. The rubber was not sticky, and exhibited very good physical qualities. It was valued at 3s. 3d. per lb. (See also this J., 1903, 918).—A. S.

Rubber of *Urceola Esculenta* from Burma. Bull. Imp. Inst. (Suppl. to Bd. of Trade J.), 1904, 2, 156—159.

FIVE specimens were sent for examination, one of which contained three distinct kinds of rubber, which were analysed separately. The results of the analyses are given in the following table:—

No. of Sample.	Place of Origin of the Rubber.	Percentage Composition.					Ash (included in Dirt).	Value.	Remarks.
		Moisture.	Caoutchouc.	Resin.	Dirt.				
19,747	Bassein	1.0	54.0	42.6	1.5	0.64	Per lb.		
19,747-1		0.9	52.1	45.5	1.5	0.56	..	..	..
19,768 A.	Pegu Division	11.6	70.7	12.1	5.6	1.30	About 3s. 2d.		Tonquin character.
" B.	"	5.9	78.4	10.9	6.8	1.32	" 3s. 6d.		Red Tonquin ball character; inclined to be heated, which would greatly affect its value.
" C.	"	9.7	73.7	8.3	8.3	2.08	" 3s.		Dark ball, slightly gummy and not well cured; might be difficult to sell at ordinary times.
19,865-1	"	2.6	75.7	18.0	3.7	1.02	3s. 6d.		Thick biscuit, strong; would command a ready sale.
20,583	Tenasserin Division.	4.0	80.5	9.8	5.7	1.16	4s.		Thin sheet, fairly strong; would fetch a good price if not heated.

The samples Nos. 19,747 and 19,747-1 were of much poorer quality than the others, and from information received since the examination, it is stated that their botanical source is rather doubtful.—A. S.

Rubber of *Rhynchodia Wallichii* and *Chonemorpha Macrophylla* from Burma. Bull. Imp. Inst. (Suppl. to Bd. of Trade J.), 1904, 2, 159—161.

THE *Rhynchodia* rubber was quite free from stickiness, and exhibited good elasticity and tenacity. It contained: moisture, 2.8; caoutchouc, 86.5; resin, 6.5; dirt, 4.2; ash (included in dirt), 0.48 per cent. It was valued at 3s. 6d. per lb. The *Chonemorpha* rubber was rather sticky, but exhibited fairly good elasticity and tenacity. The specimen was too small for commercial valuation, but the following analytical results indicate that it was of inferior quality:—Moisture, 8.0; caoutchouc, 55.2; resin, 34.6; dirt, 2.2; ash (included in dirt), 0.97 per cent.—A. S.

Pontianac from the Patiala State. Bull. Imp. Inst. (Suppl. to Bd. of Trade J.), 1904, 2, 162—163.

THE specimen examined, contained: moisture, 54.5; resin, 36.6; caoutchouc, 7.6; dirt, 1.3; ash (included in dirt), 0.94 per cent. It closely resembled commercial Pontianac both in chemical composition and in appearance and general properties. It was valued at 20l. per ton.—A. S.

ENGLISH PATENT.

Gums and Resins; Impts. in and Apparatus for the Treatment of Products containing —, and for Separation and Obtaining of Gums and Resins therefrom. J. Y. Johnson. From A. Foelsing. Eng. Pat. 21,020, Sept. 30, 1903. XIII. B., page 990.

FRENCH PATENT.

Vulcanised Caoutchouc and Ebonite; Regeneration of —. V. de Karavodine. Fr. Pat. 338,945, July 25, 1903.

THE material is pulverised and heated, with or without the addition of sulphur, in a metal mould at 150° to 200° C. under a pressure of 100 to 500 kilos. or more per sq. cm. The process may be used for obtaining vulcanite casts and for insulating cables. By adding mica or asbestos (which may previously be mixed with fused rosin, tar, drying oils, or caoutchouc solution with sufficient sulphur for vulcanisation) to the pulverised ebonite a very hard substance is produced.—C. A. M.

XIV.—TANNING; LEATHER, GLUE, SIZE.

Tanning Extracts; Manufacture of —. F. A. Bühler. Chem. Ind., 1904, 27, 478—487.

THIS is a general description of the plant and methods employed in the manufacture of extracts, with special reference to the handling of hard woods, such as quebracho. The numerous illustrations include plans and elevations for a model factory, arranged to produce 25,000 to 30,000 kilos. of extract daily.—R. L. J.

Tannin Content of Liquors from different Tannin Materials and Tannin Extracts; Variation of —. J. Paessler. *Collegium*, 1904, 277—280, 284—290, 293—296.

IT is well known that clear tannin extracts become turbid on standing, and deposit considerable quantities of a thick precipitate. Hence it is of interest to know whether this

Deposition is caused by the tannins or non-tannins separately or both together. Messrs. Youl and Griffith have already carried out experiments in this direction with strong liquors of valonia, myrobalans, and mimosa (this J., 1901, 428). The author has previously determined the variation of weak myrobalans liquor on keeping (this J., 1904, 71). He has now extended his investigations to liquors prepared from the undermentioned materials:—Oak bark, pine bark, mimosa bark, mangrove bark, valonia, trillo, myrobalans, divi-divi, knopfern, sumach, quebracho-wood extract,

soluble quebracho extracts, oak-wood extracts, chestnut extract, and black gambier. Strong liquors of these materials were prepared in an extraction battery of the usual type, and, after being allowed to settle, were filtered and made up to 2° B. The liquors were then kept in open bottles at a constant temperature and subsequently analysed, according to the I.A.L.T.C. methods, after periods of 6, 18, 30, and 60 days. The bottles were weighed to commence with, and losses of weight due to evaporation made good with distilled water. The following are the tabulated results:—

	Tannin Substances. Grms. contained in 100 c.c. of Liquor.			Non-Tannin Substances. Grms. contained in 100 c.c. of Liquor.			Total Soluble Matter. Grms. contained in 100 c.c. of Liquor.			Grms. of Non-Tannin Substance per 100 Grms. of Tannin Substance.	
	Freshly Prepared.	After 60 Days.	Loss.	Freshly Prepared.	After 60 Days.	Loss.	Freshly Prepared.	After 60 Days.	Loss.	Freshly Prepared.	After 60 Days.
Mangrove bark	3.37	3.37	0	0.56	0.55	2	3.93	3.92	0	16.5	16.5
Mimosa bark	2.85	2.79	2	0.63	0.41	35	3.48	3.20	8	22	14.5
Sumach	1.90	1.87	1.5	1.40	1.17	16	3.30	3.04	8	74	62.5
Quebracho wood	3.87	3.72	4	0.30	0.18	40	4.17	3.90	6.5	8	5
" extract	3.77	3.66	3	0.37	0.24	35	4.14	3.90	6	9	6.5
" Soluble I.	3.22	3.09	4	0.68	0.51	25	3.90	3.69	8	21	16.5
" Soluble II.	2.53	2.53	0	0.97	0.87	10	3.50	3.40	3	38	34
Gambier	2.57	2.57	0	0.95	0.60	37	3.52	3.17	10	37	23.5
Oak	2.17	2.01	7.5	1.31	0.53	60	3.48	2.54	27	60	26
Pine bark	2.12	1.90	10	1.73	1.18	32	3.85	3.08	20	82	62
Oak-wood extract	2.28	1.99	12.5	1.38	1.31	5	3.66	3.30	10	61	66
Knopfern	2.55	2.15	16	0.77	0.50	35	3.32	2.65	20	30	23
Trillo	2.49	1.92	23	0.83	0.75	10	3.32	2.67	20	33	30
Myrobalans	2.29	1.74	24	0.98	0.57	42	3.27	2.31	29	43	33
Valonia	2.45	1.73	29	0.92	0.64	30	3.27	2.37	30	38	37
Divi-divi	2.15	1.53	29	1.12	0.87	22	3.27	2.40	27	52	57

The results show that the liquors prepared from tannin materials and tannin extracts can be divided into different groups according to their behaviour on keeping. (1) Liquors which even after standing for 60 days show no perceptible diminution in the percentage of tannins, such as those prepared from mimosa bark, mangrove bark, sumach, quebracho wood and extract, and gambier. (2) Those which show a moderate (8—16 per cent.) diminution, such as oak bark, pine bark, oak-wood extract, chestnut extract, and valonia liquors. (3) Those which show a larger diminution of from 23 to 29 per cent., such as trillo, myrobalans, valonia, and divi-divi liquors. The author concludes that the insoluble matters deposited from the tannin liquors on standing are valueless from a tanning point of view.

—F. D. T.

Mangrove Barks, and Leather Tanned with these Barks, from Pemba and Zanzibar. Bull. Imp. Inst. (Suppl. to Bd. of Trade J.), 1904, 2, 163—166.

ZANZIBAR mangrove bark is said to be obtained from two different trees, "msinzi" (*Rhizophora mucronata*) and "mwi." The results refer to the air-dried bark:—

	"Msinzi" from Pemba, 1901 Specimen.	"Msinzi" from Zanzibar.	"Magomi" from Pemba.	"Mkomafi" from Pemba.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Moisture.....	18.2	16.4	18.0	16.0
Total ash .....	..	5.65	7.39	7.51
Ash soluble in water.....	1.55	1.5	1.9	Traces
Total matter soluble in water.....	40.4	50.2	40.8	29.8
Tannin	34.3	35.8	32.8	23.2

The "mkomafi" bark is stated to be of no commercial value, but the "magomi" and "msinzi" barks would probably be worth from 3*l.* 10*s.* to 4*l.* per ton, c.i.f., Glasgow. Specimens of leather from Pemba prepared with "mkomafi" and "magomi" barks were valued as low-grade boot leather, worth, in the form of sides or whole hides, about 9*d.* per lb.

—A. S.

Leather; Influence of Self-contained Moisture upon the Strength of—M. Rudeloff. Mitt. königl. Materialprüfungsamt Gross-Lichterfelde-West, 1904, 22, 8—47.

THIS investigation deals with the moisture naturally present in leather, as regards amount change in amount when the amount of moisture in the surrounding atmosphere (hereafter called "atmospheric conditions") changes, and the influence of such change on the extensibility and tensile strength of the leather. The communication is freely illustrated with tables and curve-diagrams. The following conclusions are drawn from the results. The amount of moisture in leather rapidly changes when the atmospheric conditions change. The change is rapid at first, but some days are required for complete equilibrium to be established. Equilibrium is more rapidly established when leather is losing moisture to the air than when absorbing it; but in both events the time required is longer for thick leathers than thin ones. Under similar atmospheric conditions different leathers in equilibrium hold different amounts of moisture, chrome-leather holding more than other kinds. Leather left in the air till of constant weight (in equilibrium) holds a proportionately lower amount when the atmospheric moisture itself is small, and the proportion increases as the outside moisture rises, especially with chrome-leather. With increasing moisture content leather expands, the expansion being greatest when the moisture content, to begin with, is low. Chrome-leather stretches about 2.3 per cent. when the moisture is between 10 and 30 per cent., ordinary leather only 0.8 per cent. Under similar tensile stresses, moist leather stretches in general less than dry leather. As regards chrome-leather the tensile strength increases until the moisture reaches about 50 per cent., whilst the total stretch appears to reach a maximum at 30 per cent. of moisture. Ordinary leather appears to follow similar rules. The experiments were conducted on strips of Ehenish chrome-leather, oiled leather, and harness leather.—K. L. J.

Albuminoids; Oxidation of—by Calcium Permanganate. I. Oxidation of Glue. Fr. Kutscher and M. Schenck. Ber., 1904, 37, 2928—2931.

BEST commercial German gelatin (60 grms.) was dissolved by heating with 1 litre of water, oxidised with calcium permanganate (300 grms.), the solution filtered, and the lime removed by ammonium carbonate. From the filtrate there separated on evaporation first a somewhat insoluble

substance agreeing closely in properties with oxaluramide, although the percentage of hydrogen found was unduly high, and finally a substance identified as ammonium oxamate. Glycocol is known to yield oxamic acid on oxidation, and the authors claim that their results further support Kutscher and Zickgraf's theory that the so-called hydrolytic decomposition products of albumin are really pre-existent in the albumin. (Sitzungsber. d. königl. preuss. Akad. d. Wissensch., 1903, May 28.)—R. L. J.

FRENCH PATENT.

Hides and Skins; Apparatus suitable for Treating —. C. Amidon. Fr. Pat. 343,237, May 17, 1904. Under Internat. Conv., Jan. 28, 1904.

SEE U.S. Pat. 759,844 of 1904; this J., 1904, 671.—T. F. B.

XV.—MANURES, Etc.

Phosphatic Manures; Influence of Lime on the Action of —. M. Nagaoka. Bull. Coll. Agric. Tokio Imp. Univ., 1904, 6, 195. Chem.-Zeit., 1904, 28, Rep. 291.

THE presence of lime retards the useful action of the phosphoric acid of organic fertilisers, the injurious influence of the lime, which persists up to the second crop after the application of the fertiliser, being twice as great in the case of animal manures as in that of vegetable ones. The organic constituents of the fertilisers, such as humus, diminish the injurious effect of the lime. The relative manuring value of animal phosphatic manures is about twice that of vegetable fertilisers in the first year. In the second year the relative value of vegetable fertilisers increases, but is always less than that of animal manures.

—A. S.

XVI.—SUGAR, STARCH, GUM, Etc.

Sugar Industry; Application of Electrolysis in the —. L. Gurwitsch. Z. Ver. Deutsch. Zuckerind., 1904, 1013—1045.

AFTER a theoretical discussion of the subject and a review of the processes hitherto patented, the author concludes that only three processes have a possible future, viz., anodic electrolysis with addition of lead saccharate (this J., 1902, 1545), electrolysis with two diaphragms, and removal of alkali metals by the aid of mercury cathodes. He further holds that electrolytic purification is less well adapted to the original juice or syrup than to the molasses.—W. A. C.

Milk-Sugar; Hydration of — in Solution. C. S. Hudson. J. Amer. Chem. Soc., 1904, 26, 1065—1082.

ON evaporating a solution of milk-sugar above 95° C., large crystals of the anhydrous sugar separate out, whilst below this temperature the ordinary hydrated sugar is obtained. The multi-rotation of either of these varieties in solution at 0° C. is shown to be due to a change in the state of hydration. When a large excess of the ordinary hydrate is agitated with water, a saturated solution corresponding to an "initial solubility" is formed in a few minutes; on further agitation, dehydration takes place, and more sugar goes slowly into solution up to a limiting "final solubility." At 0°, 15°, and 25° C. respectively, the initial solubilities are 14.8, 20.9, and 25.3, and the final solubilities 34.8, 49.7, and 63.4, expressed in "millimols." per 100 grms. of water.

—W. A. C.

Mixtures of Sugars; Melting Points of —. H. Gillot. Bull. Acad. Roy. Belgique, 1904, 884—854. Chem. Centr., 1904, 2, 890—891.

THE author determined the melting points of the following binary mixtures of sugars:—Mannitol-dulcitol, mannitol-dextrose, dulcitol-dextrose, dulcitol-saccharose, dulcitol-lactose, mannitol-saccharose, mannitol-lactose, saccharose-dextrose, saccharose-lactose, and lactose-dextrose. In no case was a simple isomorphous mixture produced, the addition of a small quantity of one sugar to another always causing a lowering of the melting point. The forms of the melting-point curves of all the mixtures, except that of

saccharose-lactose, point to the existence of definite compounds. The curve of the saccharose-lactose mixture consists of only two branches, the point of intersection corresponding to the eutectic mixture. The curve for the mixture of saccharose and dulcitol (the melting points of which lie close together) consists of two end portions inclined upwards, connected by a horizontal portion, but whether, as in the case of similar conductivity-curves of alloys, this form of curve indicates that isomorphous mixtures are formed by the sugars in the proportions corresponding to the horizontal portion, remains doubtful.—A. S.

Carbohydrates; Action of Hydrogen Peroxide on — in presence of Ferrous Sulphate. R. S. Morrell and A. E. Bellars. Brit. Assoc., 1904. Chem. News, 1904, 90, 158—159.

IN continuation of previous work (this J., 1902, 506; 1903, 1371), the change in optical activity of carbohydrates during oxidation with hydrogen peroxide in presence of ferrous sulphate, has been examined. In the case of the hexoses (glucose, fructose, and galactose), the decrease in the rotatory power is fairly proportional to the amount of peroxide added, up to 1 grm.-mol. of the latter. The diminution of optical activity is practically the same with glucose and fructose, but in the case of galactose, the decrease is much greater, and it was found that galactose yields a keto-acid of the hexose group rather than an osone. In the case of the bioses (maltose, lactose, and cane-sugar) there seems to be some connection between the diminution in optical activity on oxidation and the tendency to be hydrolysed. The order maltose, lactose, cane-sugar, forms an ascending series with regard to the tendency to be hydrolysed and the diminution in optical activity. Of the pentoses examined, arabinose lies between glucose and galactose with regard to the decrease in optical activity, but in the case of rhamnose, the original dextro-rotation changes to a lævo-rotation, the latter being due partly to the osone, and partly to an acid which is not rhamnonic acid.

IN examining the action of bases on osones, it was found that an alcoholic solution of an osone when treated with guanidine gives a white semi-crystalline mass of the composition $CN_2H_2 \cdot C_6H_{10}O_6(C_2H_5OH)$. The guanidine compounds of glucose, fructose, galactose, arabinose, rhamnose, and maltose were also prepared. The glucose and maltose compounds are addition products of 3 mols. of the sugar with 2 mols. of guanidine. They give strongly alkaline aqueous solutions, from which the guanidine is completely and quantitatively removed by dilute mineral acids and oxalic acid. They are apparently not hydrolysed immediately by water, since the optical activity of their solutions is much less than that of the parent sugar. In the case of glucose, the specific rotation $[\alpha]_D = +29.8^\circ$ had become $[\alpha]_D = -5.7^\circ$ after five days. An aqueous solution of the compound neutralised by hydrochloric acid gave the same rotation as free glucose.—A. S.

Sugars; Action of Methylphenylhydrazine on —. H. Ofner. Ber., 1904, 37, 3362—3363.

THE author has previously shown that pure benzylphenylhydrazine reacts with neither levulose nor dextrose. He now finds that methylphenyldextrosazone, which has been prepared by Fischer from glucosone and by Neuberg from levulose, may be obtained directly from dextrose itself; the details of the preparation are given. In some cases, where an old sample of methylphenylhydrazine reddened by partial decomposition was employed, it was found that the primary-secondary phenylmethylphenyldextrosazone was formed with the methylphenyldextrosazone. It is evident that phenylhydrazine is formed in the spontaneous decomposition of methylphenylhydrazine, just as it is in that of benzylphenylhydrazine.—T. H. P.

Molasses; Electrolytic Purification of —. L. Gurwitsch. Z. Ver. Deutsch. Zuckerind., 1904, 1045—1059.

THE following process has been worked out on the laboratory scale, and is regarded as hopeful. The molasses, diluted with twice its weight of water, is electrolysed with vertical iron-mercury cathodes (this J., 1903, 872);

the anodic part of the cell is divided off by a septum of parchment-paper and charged with a 5 per cent. solution of calcium chloride, the anode being of iron. To prevent the deposition of iron at the cathode, the anodic liquor is continuously precipitated with milk of lime. The molasses, after electrolysis, is freed from calcium saccharate by means of carbon dioxide. In the most favourable experiment, purification by one "degree of purity" per 100 grms. of sugar was effected at an outlay of 4.49 watt-hours. The by-products are (1) mixed caustic alkalis in 25–30 per cent. solution, (2) a mixture of organic acids, suggested as a substitute for tartaric and citric acids in dyeing, and (3) precipitated ferric oxide, suitable for paint.—W. A. C.

Cochlospermum Gossypium D.C.; Gum of —. P. Leme-land. J. Pharm. Chim., 1904, 20, 253–260.

An examination of the gum of *Cochlospermum gossypium* furnished the following results:—Moisture, 22.72 per cent.; ash, 4.64 per cent.; the ash contains iron, calcium, and potassium as oxide and carbonate. 2.04 per cent. of the gum is soluble in water, the solution possessing a rotatory power of + 77.15°. Determination of the galactans by Tollens' method gave 34.99 per cent. (expressed as galactose). No arabinose or sugar other than *d*-galactose could be isolated from the products. 22.59 per cent. of pentosans, equivalent to 25.64 per cent. of pentoses, was found. The total quantity of sugar could not be determined, owing to the difficulty experienced in hydrolysing the gum, the highest result obtained being less than the sum of the pentose and galactose. On oxidation with nitric acid, 71.8 per cent. of mucic acid (on the weight of gum used) was obtained.—T. F. B.

Keto-Hexoses; Reaction for —. H. J. H. Fenton. XXIII., page 1001.

Saponarin: a Glucoside coloured Blue by Iodine. G. Barger. XXIV., page 1004.

ENGLISH PATENT.

Sugar; Annular Moulds for Treating — by Centrifugal Action. J. C. F. Lafeuille, Paris. Eng. Pat. 25,779, Dec. 7, 1903.

THE annular moulds serving for moulding and centrifugalising sugar slabs or loaves are cooled by causing liquids of gradually falling temperatures to circulate successively through the annular mould and round the separate moulds for slabs or loaves, the annular moulds being provided with means both for connecting them consecutively with the supplies of liquid and for discharging such liquids.—T. H. P.

UNITED STATES PATENT.

Sugar from Beets; Process of Making —. M. Roeseler, Berlin, and A. Schauer, Holland, Mich. U.S. Pat. 770,700, Sept. 20, 1904.

THE overflow from the centrifugals is freed from alkali salts by osmosis, the resulting liquid is treated with phosphoric acid to separate the surplus "alkalis" and a part of the organic non-sugar, the surplus phosphoric acid is neutralised by the oxide of an alkaline-earth metal, and the compound thus formed is precipitated by means of carbon dioxide and sulphur dioxide. The syrup so prepared is mixed with the fresh beet juice or concentrated syrup at any convenient stage of manufacture.—J. F. B.

FRENCH PATENT.

Wood Cellulose; Process for Converting — into Sugar. M. F. Ewen and G. H. Tomlinson. Fr. Pat. 343,006, May 9, 1904.

SEE U.S. Pat. 768,472 of 1904; this J., 1904, 797.—T. F. B.

XVII.—BREWING, WINES, SPIRITS, Etc.

Malt with Short Grown Acrospire. E. Prior. Woch. f. Brau., 1904, 21, 571–572.

ON several sides recommendations have been made to employ malts with short acrospires, averaging two-thirds

the length of the corn, when it is desired to improve the fullness of body and permanence of head of the beer. The author thinks, however, that such recommendations introduce a danger of obtaining an inferior modification of the endosperm, and consequently unstable beers. The real meaning of such recommendations is that the malt should not be over-modified, as is frequently the case when the maltster strives to attain an average length of acrospire of three-quarters the length of the corn. No definite rule for malting can really be laid down on a basis of the length of the acrospire. The acrospire must be developed until complete modification of the endosperm is attained, and no longer. Above all, a malt with a restricted acrospire should never be kilned according to the Bavarian method. In order to avoid both extremes of modification, the barley should not be over-steeped, and should be grown very slowly with low temperatures in the couches. For Bavarian malt a somewhat fuller steep is necessary, and the treatment on the floor should be made in two stages; the malt should be germinated very cool until the acrospire attains a length of half the length of the corn, and then it should be allowed to felt at least once, preferably twice, in order to develop the rootlet and complete the modification. The author is in agreement with the advocates of a short-grown acrospire only so far as that is a means of avoiding over-modification, but in no case must the desire for a short acrospire be permitted to govern the treatment if the nature of the barley be such as to demand a longer growth for complete modification.—J. F. B.

Culture Yeasts; Abnormal Cell Forms of —. W. Henneberg. Woch. f. Brau., 1904, 21, 563–566 and 579–581.

THE author's studies were made principally with the distillery yeasts Races XII. and II. The abnormal forms described are not to be confounded with the ordinary "giant" cells, which are abnormal only in size, nor with the "reserve" cells studied by Will, which have not been observed in these yeasts. Most of the abnormal cells here described were obtained in the course of experiments on the longevity of the yeast on storage, and they formed a certain proportion of the cells which survived the various tests. The mass of yeast in which they occurred was dark brown in colour, having a neutral or faintly alkaline reaction and the odour and taste of yeast-extract. Hence these abnormal forms originated under conditions of auto-digestion, in a medium highly charged with albuminoids and poisonous excreta; they are therefore pathological forms. The greater portion of the pasty mass consisted of dead cells, almost emptied by digestion, with cell walls intact and containing globules of fat and residues of plasma; the normal living cells were very rich in fat and sporogenous. The abnormal forms observed comprised "medium sized round cells" rich in fat or in albumin granules, sometimes in both, "large round cells" containing vacuoles, and irregularly shaped "broad cells" similar in size to the large round cells. Many small cells, still living, had either no, or very thin, invisible cell walls. In many cases normal budding chains were observed, originating from the medium round cells. Very rarely, certain irregular-shaped amoeba-like cells were present. When transferred to a hanging drop of wort many of the round and broad cells died owing to the change in concentration; some shrivelled up, others burst and others showed double cell-walls. Those which survived swelled considerably owing to the formation of large vacuoles, the surrounding layer of protoplasm being observed to be full of rapidly moving granules. In many cases the large round cells budded, forming equally large vacuolated daughter cells, and their descendants gradually became normal. In contradistinction to the original pasty mass, the drop-culture contained a large number of amoeba-like forms, which constantly changed their shape, but did not possess much power of changing their position, some of these forms were observed to contain nuclei. By observing the transition stages it was found that the amoeba-like forms were the products of the round and broad forms: the cell walls of the latter became very thin in places, then ruptured, and the plasma, still living, emerged in the

form of amœba. Whilst the large round cells lived for several days the amœba forms died in less than two days. The formation and study of all these forms is closely dependent on the extent of dilution; when the pasty yeast mass is diluted with water these forms cannot be observed; even wort is not favourable to their development if much of it be used. When a large dilution is desired for accurate observation it is necessary to employ the albuminous liquid decanted off from yeast which has been liquefied by digestion at 48° C. for 24 hours.—J. F. B.

Yeast; Testing the Homogeneity of — P. Lindner.
Woch. f. Brau., 1904, 21, 621-622.

WHEN a sample of yeast is thoroughly homogeneous, all the cells have approximately the same size and appearance, all belong to the same species and are in the same physiological condition. When a pure yeast is first started in the propagating apparatus, it very rarely presents a homogeneous appearance, the cells being in all the different stages of development; it is not surprising that such a yeast should give different results in the fermentation tuns from a brewery stock yeast which has been in continuous use and which is generally homogeneous. The process of washing the pitching yeast eliminates the light, budding yeast, leaving the agglomerated heavy mother-yeast at the bottom. If the washing has not been thorough, the appearance of the yeast will not be homogeneous. For testing whether the yeast is homogeneous, the author recommends that it be suspended in beer and prepared in the form of droplet cultures ["Federstrich-Kultur"] each containing a definite small number of original cells. In these droplets there should be observed how many of the cells are capable of further budding, the form of the budding chains, how many descendants are produced by each cell in definite times, and whether the descendants of the various cells are alike or different. The droplet test also gives a quantitative expression for the degree of infection by wild yeasts, and the form of the budding chains indicates whether a top fermentation yeast is contaminated with bottom yeast. In some cases the cultivation of the yeast in a thin layer of beer-gelatin (Will's test) is more delicate. According to whether the colonies are mulberry-shaped or extend in "streamers," it can be ascertained whether the original cells were of the fermentative form or film-cells of the first or second generation. A preponderance of these film-cells indicates an excessive exposure to air. All the above observations should be made in order to study the influence of variations in the brewing conditions upon the homogeneity of the yeast.—J. F. B.

Zymase and Endotryptase in Dead Yeast Cells; Activity of — under various Conditions. T. Gromow and O. Grigoriev. Z. physiol. Chem., 1904, 42, 299-329. Chem. Centr., 1904, 2, 998.

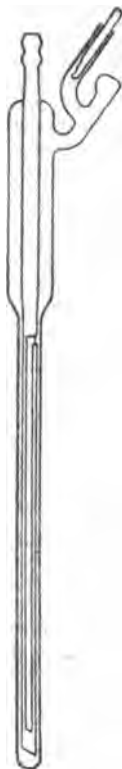
THE activity of the proteolytic enzyme (endotryptase) contained in permanent yeast (zymase) prepared by means of acetone (this J., 1902, 1033), is strongly diminished by mono- and di-saccharides and polyhydric alcohols (glycerol, mannitol), the effect being greater, the stronger the concentration of the added substances. Calcium chloride and potassium nitrate increase the activity of the endotryptase; alcohol and quinine have an injurious effect. The amount of carbon dioxide produced by zymase in the presence of unfermentable substances (mannitol) is the same as that produced by autofermentation, therefore in both cases the fermentation proceeds at the expense of the glycogen of the yeast. The cessation of the evolution of carbon dioxide is due not to the exhaustion of the nutrient material, but to the exhaustion of the zymase. The concentration of the sugar solution and the percentage of oxygen in the surrounding atmosphere are without influence on the amount of carbon dioxide evolved. The amount of carbon dioxide is increased by addition of quinine or alcohol, which injure the activity of the tryptase and consequently allow of a longer life for the zymase. Potassium nitrate and calcium chloride act in the reverse manner, as they increase the activity of the proteolytic enzyme. In almost all cases poisonous substances have directly opposite effects on zymase and tryptase. (See also this J., 1902, 60.)—A. S.

Brewery Wort; Simple Method for the Determination of the Degree of Infection of — F. Schönfeld. Woch. f. Brau., 1904, 21, 622-623.

IN order to control the sterility of the wort as it comes from the brewhouse or cooler, the author employs a glass plate, 15 cm. square, provided with 25 depressions, each capable of holding 0.4-0.5 c.c. of wort. This plate is sterilised and the hollows are filled with drops of wort delivered from a sterile pipette. Several of these plates are arranged in a wire cage, one above another, and the whole is covered with a sterilised bell jar in a moist atmosphere under aseptic conditions. Any germs present in the wort develop either in the form of concrete colonies or in the form of a turbidity. After a few days the plates are examined and the number of drops in which organisms have developed is counted. If the brewery conditions be good the number of infected drops will be very small.

—J. F. B.

Beer Casks; Pressure Regulator for — F. Schönfeld. Woch. f. Brau., 1904, 21, 623-624.



THE author describes a new apparatus, invented at the Berlin Research Brewery, for maintaining a constant pressure in the beer-casks when bunged down for secondary fermentation. The apparatus, which is shown in the figure, consists of a narrow glass tube inserted in a wider tube, which is enlarged somewhat at the upper end. The narrow tube is connected by rubber tubing with the interior of the cask through the bung-hole, and carries inside it a still smaller vertical tube, which is fused on to an opening in the side of the inlet tube, and which serves for the discharge of the gases. The outermost tube carries a branch on its enlarged portion, which is provided with a trap of peculiar shape to prevent any loss of mercury by splashing, and this trap is connected with another branch, which carries the exit tube provided with a hole in its side. Mercury is placed in the apparatus in quantity sufficient to allow of the free discharge of the gases when a certain pressure is reached. The whole apparatus is enclosed in a wire cage and hung up above the cask.—J. F. B.

Denatured Spirits; Action of — upon Metals and upon Cement. G. Heinzelmann. Z. Spiritusind., 1904, 27, 399.

STRONG spirit containing 95-96 per cent. of alcohol by volume both in the pure and in the denatured state is perfectly indifferent to any of the metals examined. But weaker spirit, such as that containing 90 per cent. by volume of alcohol has, when denatured, a considerable oxidising and solvent action upon many metals. In contact with cement, the spirit becomes yellow and the non-volatile residue increases to a very considerable extent, the lime salts of the lower members of the fatty acid series being found in solution. Cement linings for iron storage vessels containing spirits are therefore condemned. The 90 per cent. denatured spirit acts most powerfully upon zinc and lead, the liquid becoming opalescent and ultimately depositing white precipitates, and the non-volatile residue being increased owing to the solution of metallic salts. Its action upon iron is somewhat less, but a considerable formation of a brown deposit of oxide occurs after some time; this deposit is, however, readily separated by filtration. The action upon copper and brass is not great, but the spirit acquires a greenish-blue colour, and copper salts are present in the non-volatile residue. Tin and tinned metals are absolutely unattacked by 90 per cent. denatured spirit, the tinned metals only being corroded in places where the layer of tin has been scratched. Vessels of tinned iron are

the most satisfactory receptacles for denatured spirits. Whilst the presence of the water plays a certain part in the corrosion of metals by the spirit, the main cause is to be attributed to the crude methyl alcohol present in the denaturing agent; pyridine is without action upon metals.

—J. F. B.

ENGLISH PATENTS.

Yeast Extracts; Process for freeing — from Bitter Principles. C. A. Jensen, London. From R. Deissler, Berlin. Eng. Pat. 24,294, Nov. 9, 1903.

THE yeast extracts are treated, before or after the removal of the cell-residues and before or after concentration, with a suitable proportion of an oxidising agent, such as ozone or a peroxide. For instance, the extract may be concentrated to half its volume and treated with hydrogen peroxide in the proportion of 60–100 c.c. per kilo. of concentrated extract, then boiled and clarified.—J. F. B.

Brewing; Art of —. J. Schneible, Weehawken, U.S.A. Eng. Pat. 14,028, June 21, 1904.

IN this process, the peptonised malt mash is brought to a pre-determined converging temperature without permitting diastatic action at any other temperature. This is effected by thoroughly and immediately mixing the peptonised malt mash with either a heating medium or a cooked (unmalted cereal) mash at a higher temperature.—T. H. P.

Wine, Must, Beer, Beetroot Juice, and the like: Treatment [Concentration] of —, and Apparatus therefor. E. Monti, Turin, Italy. Eng. Pat. 19,645, Sept. 11, 1903. Under Internat. Conv., Sept. 12, 1903.

SEE Fr. Pat. 324,474 of 1902; this J., 1903, 567.—T. F. B.

UNITED STATES PATENT.

Yeast. M. P. Davies and E. Wilding, London. U.S. Pat. 770,356, Sept. 20, 1904.

SEE Eng. Pat. 8771 of 1901; this J., 1902, 786.—T. F. B.

FRENCH PATENTS.

Malt; Drum for Germinating and Drying —. Soc. Holst and Fleischer. Fr. Pat. 343,348, May 21, 1904. SEE Eng. Pat. 11,752 of 1904; this J., 1904, 877.—T. F. B.

Yeast; Manufacture of —. Maschinenbau Aktienges. Gölzern-Grimma. Fr. Pat. 343,133, May 13, 1904.

FERMENTATION is assisted by adding nutrient organic or inorganic salts to the worts. The inorganic salts should contain especially potassium or ammonium phosphate; the organic salts may be obtained in the form of a decoction of waste yeast. The additions may be made either in the mash tun or in the fermenting vessel.—J. F. B.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(A.)—FOODS.

ENGLISH PATENT.

Milk Powder; Manufacture of —. J. Maggi, Paris. Eng. Pat. 9684, April, 27, 1904. Under Internat. Conv., April 1, 1904.

SEE Fr. Pat. 341,840 of 1904; this J., 1904, 909.—T. F. B.

UNITED STATES PATENTS.

Fruit Juices: Process of Preserving —. D. Sandmann, Berlin, and G. Eichelbaum, Charlottenburg, Germany. U.S. Pat. 770,658, Sept. 20, 1904.

SEE Fr. Pat. 325,811 of 1902; this J., 1903, 756.—T. F. B.

Condensing Milk; Process of —. S. R. Kennedy, Philadelphia. U.S. Pat. 770,909, Sept. 27, 1904.

CLAIMS are made for condensing milk and cream by separating the milk from the cream, condensing the milk, and

recombining the condensed milk and fresh cream by spraying the two together through a high vacuum.

—T. H. P.

FRENCH PATENTS.

Foodstuff [Casein] from Milk; Concentrated —, and Process for making same. C. Lewis. Fr. Pat. 343,030, May 10, 1904.

SEE Eng. Pat. 11,094 of 1904; this J., 1904, 797.—T. F. B.

Candles, Lamp Oils, Edible Fats, Unguents or Pomades, Soaps, &c.; Manufacture of —. C. Dreymann. Fr. Pat. 343,158, May 14, 1904. XII., page 988.

(B.)—SANITATION; WATER PURIFICATION.

Bacterioscopic Examination of Water; Standardisation of Methods for the —. XXIII., page 1002.

ENGLISH PATENT.

Water-purifying Apparatus. O. Walter, Halle on Saale, Germany. Eng. Pat. 17,307, Aug. 8, 1904. Under Internat. Conv., Sept. 21, 1903.

IN a water-softening plant the milk of lime is raised from the dissolving vessel, which contains a stirring mechanism, by means of a pump which lifts it through a pipe arranged in a closed circuit. At the upper part of the lift-pipe is a valve, which is periodically opened by the water-measuring device, thereby withdrawing a certain quantity of milk of lime for the treatment. The pump is kept at work continuously, and when the draw-off valve is closed, the constant circulation prevents the deposition of solid matter in any part of the apparatus.—J. F. B.

FRENCH PATENT.

Sewage and other Liquids; Process for Purifying —, and Apparatus therefor. W. O. Travis and E. Ault. Fr. Pat. 343,150, May 14, 1904. Under Internat. Conv., May 15, 1903.

SEE Eng. Pat. 11,073 of 1903; this J., 1904, 676.—T. F. B.

(C.)—DISINFECTANTS.

Nicotine in Presence of Pyridine [in Sheep Dips, &c.]; Determination of —. J. A. Emery. XXIII., page 1003.

ENGLISH PATENT.

Antiseptics which are otherwise Insoluble, or not easily Soluble; Process for forming Solutions of —. O. Kösters, Bremen, Germany. Eng. Pat. 19,837, Sept. 15, 1903.

SEE Fr. Pat. 335,306 of 1903; this J., 1904, 201.—T. F. B.

UNITED STATES PATENT.

Antiseptic Compound, and Process of Making same. H. Endermann, New York. U. S. Pat. 770,275, Sept. 20, 1904.

ROSIN is treated with caustic alkali to convert it into rosin size, and the latter is then subjected to the action of permanganic acid. The oxidised product is soluble in hot water and in alcohol, less soluble in ether and partially soluble in benzene and chloroform. It has a bitter taste, and melts between 105° and 125° C.—J. F. B.

FRENCH PATENT.

Vaporisation of various Substances [Disinfectants, &c.]; Apparatus for the —. P. Castanet, Fr. Pat. 343,155, May 14, 1904.

THE apparatus is intended for the vaporisation of substances affecting the respiratory organs, and for disinfecting and scenting purposes. It consists of a hollow metal truncated cone or cylinder, perforated by a number of holes at the top and bottom. Inside this metal vessel is placed a paraffin burner, and on top of it a box containing a mixture of magnesium carbonate, trioxymethylene, eucalyptus oil, and turpentine. The magnesium carbonate may be replaced

by talc, calcined magnesia, or some porous earth. Metal tubes are embedded in the mixture to assist the liberation of vapours.—L. F. G.

XIX.—PAPER, PASTEBOARD, Etc.

ENGLISH PATENTS.

Paper Machines; Shower-pipes or Cleansing Apparatus for — F. W. Howarth, London. From The Sandusky Foundry and Machine Co., Ohio, U.S.A. Eng. Pat. 20,840, Sept. 28, 1903.

For cleaning the wire and rolls of the paper machine a shower pipe is provided having a line of discharge orifices. A "longitudinal member" fits over the pipe and carries a longitudinal plate projecting obliquely to the orifices. The sprays of water issuing from the orifices impinge on the deflecting plate and are directed by the latter in the form of a continuous sheet of water against the part of the machine to be cleansed. By duplicating the line of orifices, and having a second deflecting plate on the "longitudinal member," two sheets of water can be discharged in opposite directions from the same shower pipe.—J. F. B.

Celluloid or the like; Method of Imparting Lustre to Objects made of — W. Homberger, Brugg, Switzerland. Eng. Pat. 17,232, Aug. 6, 1904.

The glacial acetic acid used for imparting lustre to celluloid objects is replaced by acetic anhydride, alone or mixed with acetic acid, and preferably mixed with benzene, toluene, chloroform, or similar organic solvent. A suitable mixture consists of 2 parts of acetic anhydride, 2 parts of toluene, and 1 part of glacial acetic acid.—T. F. B.

UNITED STATES PATENT.

Wood; Method of Treating [Distilling], — for the Production of Paper Pulp, Turpentine, &c. W. Hoskins. U.S. Pat. 770,463, Sept. 20, 1904. XIII. B., page 990.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Papaverine. M. Freund and H. Beck. Ber., 1904, 37, 3321—3324.

By the electrolytic reduction of papaveraldine sulphate, employing lead poles and a porous cell, the authors obtained, with the elimination of the carbonyl oxygen, a secondary base having the formula $C_{20}H_{28}NO_4$. This formula corresponds with that of tetrahydropapaverine, but the new compound is not identical with that body. The new base has been termed provisionally *isotetrahydropapaverine*; it yields a crystalline nitroso-compound melting at 138° C., and its hydriodide crystallises in small white columns, which begin to soften and turn yellow at 245° C. and melt at 255° C. The ethereal solution of the base, when treated with methyl iodide, yields a yellowish-brown crystalline powder, which is apparently the hydriodide of the methylated base.—J. F. B.

Terpenes and Essential Oils. O. Wallach. Annalen, 1904, 336, 1—46. [68th and 69th Communications.]

THE 68th communication deals with the behaviour of the nitrites of some cyclic hydrocarbons (indene and methylinene). The 69th article treats of phellandrene, described as a hydrocarbon, $C_{10}H_{16}$, which in contact with nitrous anhydride, N_2O_3 , in an indifferent anhydrous solvent (ligroin) at a temperature below 0° C. yields immediately a well characterised nitrate. The *d*-phellandrene prepared from elemi oil is chemically and physically identical with that from bitter fennel oil. The *l*-phellandrene present in Australian eucalyptus oil is the optical antipode of the above-mentioned *d*-phellandrene. The *d*-phellandrene of water-fennel oil is chemically different from the *d*-phellandrene of elemi and bitter fennel oils. The name *α*-phellandrene is proposed for that modification present in elemi and bitter fennel oils in the *d*-form, and in eucalyptus oil in the

l-form; and *β*-phellandrene for the modification contained in water-fennel oil. The experimental work is described under the following headings:—I. *α*-Phellandrene: (1) its nitrite; (2) action of nitric acid on the nitrite; (3) action of hydrochloric acid on the nitrite; (4) action of sulphuric acid on the nitrite; (5) conversion of *α*-phellandrene into active carvotanacetone. II. *β*-Phellandrene.—A. S.

Lemon-grass Oil from Montserrat. Bull. Imp. Inst. (Suppl. to Bd. of Trade J.), 1904, 2, 166—167.

THE sample of oil examined, was obtained from *Andropogon nardus* L., var. *genuinus* Hack, which is commonly known as the true lemon-grass. It was soluble to the extent of about 97 per cent. in 70 per cent. alcohol. On distillation it yielded about 25 per cent. between 180° and 220° C., and 50 per cent., consisting chiefly of citral, between 220° and 280° C. The results obtained on examination of the oil are given in the following table, together with the corresponding figures for commercial lemon-grass oil distilled in India from *Andropogon citratus*.

	Montserrat Lemon-grass Oil.	East Indian Lemon-grass Oil.
Sp. gr. at 15° C.	0.906	0.899—0.903
Optical rotation in 100 mm. tube.	—0° 10'	+1° 25' to 3° 5'
Percentage of citral (by sodium disulphite method).	74.6	70—75

The East Indian oil is completely soluble in 70 per cent. alcohol. The Montserrat oil is valued at 5d.—6d. per ounce.—A. S.

Gymnema Leaves; Chemical Examination of — F. B. Power and F. Tutin. Brit. Pharm. Conf., Aug. 1904. Pharm. J., 1904, 73, 234—239.

FROM an alcoholic extract of the leaves of *Gymnema sylvestre* there was precipitated by the addition of water, a quantity of soft, dark-coloured resinous matter, of an acid nature. The greater part of the precipitate was soluble in petroleum spirit, and from the extract after treatment with an alcoholic solution of potassium hydroxide, hentriacontane, $C_{31}H_{64}$, m. pt. 68° C. was isolated by shaking out with ether (yield 0.05 per cent. on the weight of the leaves). The alkaline solution when acidified and distilled, yielded formic acid and a butyric acid. The filtrate from the precipitated resinous matter yielded, when acidified with sulphuric acid, a quantity of dark-coloured resinous matter, the "gymnemic acid" of Hooper (Chem. News, 1889, 59, 159). The authors find, however, that this precipitate is an impure and complex mixture of substances. By treatment with ethyl acetate about 35 per cent. of it was extracted, and this portion possessed the property characteristic of gymnema leaves of destroying the sense of taste for sweet substances. The name "gymnemic acid" is retained for this portion soluble in ethyl acetate, which is also readily soluble in alcohol, but insoluble in ether, chloroform, benzene, and water. It is not a glucoside, but has very weak acidic properties. When fused with potassium hydroxide, it yielded acetic acid and a molecular compound of protocatechuic and *p*-hydroxybenzoic acids. The portion of the resinous matter insoluble in ethyl acetate was readily soluble in alcohol. It is of an acidic nature, but has no anti-saccharine property. When fused with potassium hydroxide it yielded formic acid, and apparently a small amount of acetic acid, together with the molecular compound of protocatechuic and *p*-hydroxybenzoic acids previously mentioned. The original aqueous solution from which the preceding substances had been separated contained a *l*-quercitol (see this J., 1904, 797) associated with optically inactive glucose. No evidence could be obtained of the presence in the leaves of *Gymnema sylvestre* of a cyanogenetic compound, such as was observed by Greshoff in the leaves of *G. latifolium* (this J., 1891, 268). Neither gymnemic acid nor the resin insoluble in ethyl acetate possess toxic properties. The fruits of *Gymnema sylvestre* appear to have the same constituents as the leaves, but no quercitol could be obtained from them.—A. S.

Nux Vomica Extract; Official Process for — in the Forthcoming [French] Codex. E. Bourquelot. J. Pharm. Chim., 1904, 20, 289—293.

In view of the decision of the Brussels Internat. Pharm. Conf. in 1902, the official extract of nux vomica of the Codex is to be standardised to contain 16 per cent. of total alkaloids. The drug is directed to be extracted by the macero-percolation method with 70 per cent. alcohol; the percolate, after distilling off the alcohol, is concentrated by evaporation to about 150 grms. for every 1,000 grms. of drug used, diluted with 50 c.c. of water, and fat removed by shaking out with three successive 50 c.c. of ether. The mixed ethereal extracts are distilled, and the oily residue is washed free from alkaloids with 15 c.c. of boiling water rendered acid with acetic acid. This acid solution is then added to the aqueous ether-washed extract, and the whole is evaporated to about 200 grms., or until all trace of ether has been driven off. The amount of dry extractive and of total alkaloids are then determined in aliquot portions of the liquid.

Determination of the Alkaloids.—Four grms. of the liquid are treated in a separator with 20 c.c. of a mixture of 95 per cent. alcohol, 2 vols.; solution of ammonia (sp. gr. 0.960) 1 vol.; distilled water, 1 vol. After thorough agitation, the mixture is shaken out first with 20 c.c. then with two successive 15 c.c. of chloroform. The combined chloroformic extracts are evaporated to dryness, and the dry alkaloidal residue is taken up with 20 c.c. of N/10 sulphuric acid and 50 c.c. of distilled water, the whole being heated for 15 minutes on the water-bath to effect solution. The acid liquid is filtered, the filter washed, and the final volume of filtrate adjusted to 200 c.c. 50 c.c. of this (equivalent to 1 gm. of the original extract) are then titrated back, in the presence of 20 c.c. of ether, with N/100 sodium hydroxide solution, using 5 drops of a 0.2 per cent. solution of Iodeosin as indicator. The number of c.c. of N/100 alkali used is divided by 10; 5 is subtracted from the result, the product multiplied by 0.0364 (the mean equivalent of brucine and strychnine) gives the percentage of total alkaloid in the original liquid. From these data, and the amount of dry extractive found, the quantity of milk sugar to be added to give a dry extract containing 16 per cent. of total alkaloids, is calculated. This amount having been added, the whole is evaporated to dryness, powdered, and preserved in well closed vessels.

—J. O. B.

Nan-ta-yok or Burmese Storax; Properties of —.
D. Hooper. XIII. B., page 990.

Arsenic; Report and Recommendations with Reference to the Tests for the Detection of — in the Drugs of the British Pharmacopœia. Presented to the Pharmacopœia Committee of the General Medical Council, May 1904. W. R. Dunstan and H. H. Robinson. XXIII., page 999.

ENGLISH PATENT.

Rufisgallic Acid Alkyl Ethers; Manufacture of Acidyl Derivatives of —. A. Zimmermann, London. From Chem. Fabr. auf Actien, vorm. E. Schering, Berlin. Eng. Pat. 22,163, Oct. 14, 1903.

SEE U.S. Pat. 751,216 of 1904; this J., 1904, 267.—T. F. B.

UNITED STATES PATENTS.

Dialkylbarbituric Acids; Process of Making —. E. Fischer, Berlin, Assignor to the Firm of E. Merck, Darmstadt, Germany. U.S. Pat. 770,743, Sept. 27, 1904.

SEE Fr. Pat. 338,183 of 1903; this J., 1904, 622.—T. F. B.

Camphor [from Isobornol]; Process of Making —. K. Stephan and P. Hunsalz, Assignors to Chem. Fabr. auf Actien, vorm. E. Schering, Berlin. U.S. Pat. 770,940, Sept. 27, 1904.

SEE Fr. Pat. 341,514 of 1904; this J., 1904, 881.—T. F. B.

FRENCH PATENTS.

Chlorostyrolene; Process of Making —. M. Dinesmann. Fr. Pat. 338,904, July 4, 1903.

PHENYLDICHLORO-ACETALDEHYDE, obtained by condensing chloral with benzene in presence of aluminium chloride, is converted, by treatment with zinc dust and acids, into monochlorostyrolene. By replacing the benzene in the condensation with homologues of benzene, the corresponding homologues of chlorostyrolene are obtained. These latter, as well as chlorostyrolene itself, are applicable in perfumery.—T. F. B.

Hydroxybenzaldehydes and Hydroxybenzoic Acids; Production of Sulphonic Ethers of —. Badische Anilin und Soda Fabrik. Fr. Pat. 338,908, July 4, 1903.

SEE Eng. Pat. 17,347 of 1903; this J., 1904, 798.—T. F. B.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Photographs in Natural Colours by the Three-Colour Process; Use of Leuco-bases for the Preparation of —. E. König. Ges. deutsch. Naturforscher u. Ärzte, Sept. 1904. Z. angew. Chem., 1904, 17, 1513—1514.

LEUCO-BASES when exposed to light are oxidised to the corresponding dyestuffs in a more or less short time. In applying this property to the preparation of coloured photographs, a collodion-emulsion gives the best results, the oxidation of the leuco-bases in this medium, especially in presence of quinine, proceeding very rapidly, probably by the action of the nitro groups of the nitrocellulose. In carrying out the process a suitable support is coated with a film of a collodion-emulsion containing a dissolved leuco-base of a blue dyestuff and some quinoline. This is covered with the negative of the photograph to be printed, exposed, and the image fixed by treatment with chloro-acetic acid. These operations are repeated after applying (1) an emulsion containing a leuco-base of a red dyestuff and (2) one containing a leuco-base of a yellow dyestuff.—A. S.

Wood; Action of — on a Photographic Plate in the Dark. W. J. Russell. Proc. Roy. Soc., 1904, 74, 131—134.

ALL woods are found to possess the property of producing images of themselves on a photographic plate in the dark. The wood has to be in contact with, or a short distance from, the plate for from half an hour to 18 hours, at a temperature not above 55° C. The wood of the conifers is very active, and this activity is thought to be largely due to the resinous substances present; in most cases the light rings of the wood are active, but in the case of the Scotch fir the effect is caused by the darker portions. Oak, beech, Spanish chestnut, and sycamore woods are also very active, whilst ash, elm, horse chestnut, and plane are but slightly so. The active constituents of the wood appear to be the resinous substances, and it was found to be extremely difficult to remove them so completely that the wood becomes inactive. If a portion of the wood be exposed to bright sunlight the activity was greatly increased; comparatively inactive woods, such as elm, showed considerable activity after such exposure. Exposure to red or green light gave little or no increase in activity, but the action of blue light was almost as great as that of white light in increasing the activity of the wood. Resin, guaiacum, copal, and turpentine showed a similar increase in activity under blue light. (See also von Aubel, this J., 1904, 560.)—T. F. B.

ENGLISH PATENT.

Pigment Photographic Process. H. Schmidt, Berlin. Eng. Pat. 17,610, Aug. 12, 1904.

BICHROMATED pigment paper is pressed while wet on a thin transparent sheet of mica, celluloid, or similar material, dried, and a print made on it through the transparent "carrier." Development is carried out as usual, the transparent sheet forming the temporary support, from which the picture is easily detachable. The degree of adhesion

between the gelatin and the support can be modified by previously treating the support with wax, varnish, rubber, or other suitable substance.—T. F. B.

UNITED STATES PATENTS.

Pictures or the like; Reproducing — [by Catalysis]. W. Ostwald and O. Gros, Leipzig, Germany. U.S. Pat. 770,533, Sept. 20, 1904.

SEE Eng. Pat. 22,841 of 1901; this J., 1903, 380.—T. F. B.

Developing Catalytic Pictures. W. Ostwald and O. Gros, Leipzig, Germany. U.S. Pat. 770,534, Sept. 20, 1904.

SEE Eng. Pat. 13,920 of 1903; this J., 1903, 1015.—T. F. B.

FRENCH PATENT.

Cyanines [for Photographic Purposes]; Process for Making new —. Act. Ges. f. Anilinfabrikation. Fr. Pat. 342,656, April 26, 1904.

UNLIKE the α -naphthoquinoline derivatives, β -naphthoquinoline alkyl halides react with the alkyl halides of quinoline or *m*- or *p*-toluquinoline in presence of alkali hydroxide in aqueous solution to form Cyanines. Naphthoquinolines will not react in a similar way with naphthoquinolines, but the alkyl halides of both α - and β -naphthoquinolines form Cyanines with quinoline or with *m*- or *p*-toluquinoline in the usual manner. The Cyanines thus prepared, containing the naphthalene nucleus, are of great value for colour-sensitising photographic emulsions, giving greater sensitiveness for orange and red than other known Cyanines, and at the same time causing no diminution of sensitiveness for the colours at the other end of the spectrum.—T. F. B.

XXII.—EXPLOSIVES, MATCHES, Etc.

ENGLISH PATENT.

Explosives. E. Steele, Berlin. Eng. Pat. 11,000, May 12, 1904.

SEE Fr. Pat. 336,783 of 1903; this J., 1904, 386.—T. F. B.

XXIII.—ANALYTICAL CHEMISTRY.

INORGANIC—QUALITATIVE.

Nickel Salts; Reaction of Potassium Nitrite with —. C. Reichard. Chem.-Zeit., 1904, 28, 885—886 and 912.

THE triple nitrites of nickel, potassium, and alkaline earth metals (this J., 1904, 683) are readily distinguished from potassium cobalt nitrite by their greenish or dingy-yellow colour, and by their behaviour with boiling water, in which the cobalt salt dissolves with a red, the nickel salt with a green colour. Again, whilst the presence of acetic acid is necessary for the precipitation of the cobalt salt, it absolutely prevents that of the nickel compounds. This difference may perhaps be made use of in the technological separation of nickel, along with barium, strontium, or calcium, from cobalt. The after separation of nickel from the alkaline-earth metal is an easy matter. For the preparation of these nickel compounds pure potassium nitrite should be used; but if a commercial nitrite containing hydroxide be used, the triple salt can be freed from co-precipitated nickel hydroxide by dissolving in boiling water, filtering, and cooling; repetitions of this will also purify it from excess of potassium nitrite or of alkaline-earth, though there is considerable loss from the solubility of the compound in cold water. All of these compounds are destroyed by acids, even by acetic acid. Alkalis act but slowly on them in the cold, more rapidly when heated; the precipitate formed by sodium hydroxide is nickelous hydroxide, while that formed from potassium cobalt nitrite is cobaltic hydroxide—so that the nickel compounds are altogether different in constitution from the cobalt salt. Analysis shows that these compounds have the formula $2\text{Ni} \cdot (\text{NO}_2)_2 \cdot \text{M} (\text{NO}_2)_2 \cdot 2\text{KNO}_2$, where $\text{M} = \text{Ba}, \text{Sr}, \text{or Ca}$.—J. T. D.

Arsenic; Reports and Recommendations with reference to the Tests for Detection of — in the Drugs of the British Pharmacopæia. Presented to the Pharmacopæia Committee of the General Medical Council. May 1904, W. R. Dunstan and H. H. Robinson.

Proposed Tests.—The freedom of any drug from arsenium (As) is to be proved by comparing the stain yielded when it is submitted to one of the following tests, with that given by a known volume of *Liquor Arsenici Hydrochloricus* suitably diluted, submitted to the same test.

Test A.—An aqueous solution of 4 grms., or the prescribed quantity, of the drug to which 5 c.c. or more of hydrochloric acid have been added, is diluted to 25 c.c. with water, and introduced into a test-tube having a diameter of about 18 mm. and a length of 18 to 20 cm. Granulated zinc, sufficient to reach about two-thirds of the height of the liquid is then added. Immediately, a small plug of cotton wool, and then another plug of cotton wool which has been soaked in lead acetate solution and dried are inserted, so as to leave a short space between the two plugs; a closely fitting cap formed of two pieces of filter-paper which have been soaked in mercuric chloride solution and dried, is then fitted over the mouth of the test tube. The test must be allowed to continue for 2 hours at least; the test paper is then examined, in daylight, for a yellow stain. The test should be performed in a place protected from strong light. Ten c.c. of the *Liquor Arsenici Hydrochloricus* are diluted to 75 c.c. when 1 c.c. of the solution contains 0.001 grm. of arsenium. Four c.c. of this solution diluted to 1000 c.c. afford the standard solution, each c.c. of which contains 0.004 mgrm. of arsenium and is equivalent, for purposes of comparison with 4 grms. of the drug, to 1 part per 1,000,000. Therefore the yellow stain from 4 grms. of the drug should be paler than the yellow stain from 3 c.c. of this solution mixed with water and with 5 c.c. or a suitable quantity, of hydrochloric acid, diluted to 25 c.c. and tested in a similar manner and at the same time. The dilute arsenical standard solution should be freshly prepared.

When the drug cannot be conveniently dissolved in 25 c.c. of liquid or when frothing occurs, the test may be conducted in a small flask, the stain being compared with the standard stain obtained under similar conditions.

The yellow stain due to sulphur is soluble in less than 10 minutes in a few c.c. of hydrochloric acid, whereas that due to arsenium changes to an orange colour and persists for one or two hours. The zinc employed should first be washed for a few seconds with hydrochloric acid, and then with water, shortly before use, to remove any adherent sulphur compounds.

Test B.—Four grms. of the drug are introduced into a 60 c.c. distillation flask, with 2 grms. of potassium metasulphite, and 22 c.c. of a mixture of hydrochloric acid and water in such proportions that, after reaction, "there shall be hydrochloric acid solution approximately of the constant boiling strength, that is, 20 parts of free hydrochloric acid to 80 parts of water." The flask is then attached to a condenser the internal tube of which should not exceed 8 mm. and heated gently for one hour to reduce any arsenic compounds. It is then distilled until three-fourths have passed over; the distillate is partially neutralised with strong solution of ammonia, so as to leave unsaturated about 4 c.c. of the 20 per cent. hydrochloric acid (1 c.c. of strong solution of ammonia neutralises 2.8 c.c. of 20 per cent. hydrochloric acid). Some distillates, especially those from antimony and bismuth compounds, effervesce with zinc more violently than the solutions of other substances, so that in these less than 4 c.c. of acid should be left un-neutralised. The sulphur dioxide in the distillate is then removed by means of bromine solution until the red colour is permanent, on warming for a minute or two. Excess of bromine is then removed with solution of hydroxylamine hydrochloride until the liquid is colourless. The liquid is then diluted to 25 c.c. with water, and the process completed as described under Test A. When effervescence has ceased, a further addition of hydrochloric acid should be made to ensure that all the arsenium has been evolved. The stain obtained is compared with that from 3 c.c. of the dilute standard solution submitted to the same process.

Methods for particular Drugs.—Modifications of the above tests to meet the special requirements of the case are given in minute detail.

Proposed Limits.—Those drugs which are directed not to yield any characteristic reaction with the tests for arsenium should contain less than 3 of arsenium : 1,000,000, equivalent to 4 of arsenious anhydride : 1,000,000, except in the case of nitric and tartaric acids, which should contain less than 1 of arsenium : 1,000,000; of hydrochloric, nitric, and sulphuric acids, which should contain less than 0.3 : 1,000,000; and of stronger solution of ammonia, which should contain less than 0.1 of arsenium : 1,000,000.

Suggested Additions to the List of Drugs which should give no characteristic Reaction for Arsenium:—

Acidum boricum; Acidum citricum; Acidum salicylicum; Adeps lanae (lanoline); Alumen; Ammonii bromidum; Ammonii carbonas; Calcii carbonas precipitatus; Calcii chloridum; Calcii hydrazas; Calx; Ferri sulphas; Ferrum; Ferrum redactum; Gelatinum; Glusidum (saccharin); Iodum; Liquor hydrogenii peroxidum; Magnesia levis; Magnesia ponderosa; Magnesii carbonas levis; Magnesii carbonas ponderosus; Magnesii sulphas; Phenacetinum; Phenazonum (antipyrine); Potassii carbonas; Potassii chlorus; Potassii citras; Potassii tartar; Potassii tartar acidus; Quinina hydrochloridum; Quinine hydrochloridum acidum; Quinine sulphas; Sapo animalis; Sapo durus; Soda tartarata; Sodii bicarbonas; Sodii carbonas; Sodii hypophosphis; Sodii phosphas; Sodii sulphas; Sulphonat; Syrupus glucosi.

Test B. or a modification thereof is employed in the case of antimony, bismuth, copper, iron, and lead salts, gelatin, and quinine salts. The remaining drugs are to be tested by Test A. unless they contain iron, when Test B. must be substituted.—J. O. B.

INORGANIC—QUANTITATIVE.

Sulphur; Photometric Determination of — in Coal.
S. W. Parr and C. H. McClure. S. Amer. Chem. Soc., 1904, 26, 1139—1143.

THE coal is burnt in a bomb with sodium peroxide, and after dissolving the residue, the sulphuric acid is precipitated as barium sulphate, and the amount of the latter determined "photometrically." To obtain concordant results, 100 c.c. of the slightly acid solution are treated with the requisite amount of the barium salt, e.g., chloride, in crystals, and when these have dissolved, the whole is heated to 70° C., allowed to stand for half an hour, cooled, and then examined "photometrically." The apparatus consists of a tube, graduated in millimetres, with a carefully blown round bottom, ground on the outside. The tube stands in a flask containing water, which rests on a glass plate placed upon a carbon plate about $\frac{1}{8}$ in. thick, having a $\frac{1}{4}$ -in. hole in the centre. An ordinary candle is arranged about 10 in. vertically below the hole in the carbon plate. The liquid containing the precipitated barium sulphate is filled into the graduated tube until the light from the candle-flame, as observed through the column of liquid, is extinguished. A table is given showing the relation of sulphur content to height of column of liquid through which the light can no longer be seen; but operators are advised to check or replace it for themselves, using a standard solution of potassium sulphate.—W. A. C.

Sodium Water-Glass; Analysis of —. P. Heermann. Chem.-Zeit., 1904, 28, 879—880 and 883—884.

THE free alkali in water-glass may be determined after precipitation of the silicate by (1) salt solution and alcohol, or (2) barium chloride. (1) A mixture of 10 grms. of water-glass, 100 c.c. of water, and 20 c.c. of saturated salt solution is made up to 250 c.c. by the addition of neutralised alcohol. The solution is then filtered, and 100 c.c. of the filtrate are titrated with N/10 acid and phenolphthalein. (2) This very old method has fallen into disuse largely because the conditions necessary for accuracy were only imperfectly understood. The most important source of error lies in the solubility of freshly-formed hydrated barium silicate, which is perceptibly soluble in cold, much

more so in hot water and very much less so in alcohol, sodium chloride solution, or barium chloride solution. By working in the cold with a minimum volume of liquid, and adding a considerable excess of barium chloride, satisfactory results are obtained, as follows: To 10 grms. of water-glass add 100 c.c. of water, then, in a slow stream and with constant agitation, 100 c.c. of barium chloride solution, containing at least 10 grms. of the anhydrous salt. Make up to 250 c.c., shake well, filter at once through a dry paper, throw away the first 20—30 c.c., and titrate 100 c.c. of the filtrate with N/10 acid and phenolphthalein. On the whole the author regards this method as preferable to that given under (1). A high alkalinity in water-glass has both advantages and disadvantages as regards its use in the treatment of silk. The more alkaline it is the more stable in presence of acid reagents; the more acid (i.e., the higher in silica) the more readily is it decomposed, but the more silica does it deposit in the fibre. As the substance is very cheap, and the bath can be readily renewed, a high silica-content is most advantageous, but this must not be carried so far as to render the product viscous or unfilterable. In practice, the ratio $\text{SiO}_2 : \text{Na}_2\text{O} = 3.1 : 3.2$ is most usual, equivalent to a "basicity-number ($\text{SiO}_2 : \text{Na}$)" of at least 4. A résumé of the usual methods for determining total alkali, silica, and neutral salts concludes the paper.—J. T. D.

Ozone; Quantitative Precipitations and Separations by means of — [Determination of Manganese]. F. Jannasch and W. Gottschalk. Ber., 1904, 37, 3111.

A PRELIMINARY communication. By leading ozonised oxygen through a solution of ammonium-manganese sulphate rendered acid with acetic acid, manganese peroxide was precipitated, yielding Mn_2O_3 , equivalent to 19.28 per cent. of the substance taken, against 19.50 per cent. calculated. In the filtrate no manganese could be detected by any of the usual reagents.—J. T. D.

Phosphorus in Solutions; Quantitative Determination of —. A. C. Christomanos. Z. anorg. Chem., 1904, 41, 805—814.

IN determining phosphorus in ether or benzene solutions, the solution containing the phosphorus, it is proposed, shall be weighed in a tared glass flask, shaken for some minutes with excess of a 10 per cent. solution of copper nitrate, and the ether or benzene expelled by heating on a water-bath for 15—20 minutes. Bromine is then added gradually, with shaking, to the warm liquid, till the whole of the black copper phosphide is decomposed. The excess of bromine is now expelled and the phosphorus compounds oxidised to phosphoric acid by heating with excess of concentrated nitric acid. Ammonia is added till the light-blue copper hydroxide which separates is re-dissolved, and the phosphoric acid is determined in the usual way as magnesium pyrophosphate.—A. S.

Lead [in Brass, Bronze, &c.]; Determination of —. E. J. Ericsson. J. Amer. Chem. Soc., 1904, 26, 1135—1139.

THE author modifies the method of Walters and Affelder (this J., 1903, 927) by leaving the iron, which must not be excessive, together with the lead, and by substituting a permanganate titration for the iodometric one. In a bronze analysis, 25 c.c. of strong ammonia are added to the filtrate from tin, then gradually 3—4 grms. of ammonium persulphate; the liquid is boiled for five minutes, the precipitate allowed to settle, and collected on a filter; it consists of lead peroxide and ferric hydroxide; this is then washed with dilute ammonia (1:5) until free from copper and then 4—5 times with hot water. The precipitate and filter are returned to the beaker and agitated with 25 c.c. of hydrogen peroxide reagent (900 c.c. of water, 50 c.c. of concentrated nitric acid, 15 c.c. of hydrogen peroxide U.S.P.). After reaction 20 c.c. of nitric acid (sp. gr. 1.28) and 150 c.c. of water are added, the liquid again agitated, and titrated with permanganate of such strength that 1 c.c. = 0.002 grm. of iron = 0.00384 grm. of lead.

—W. A. C.

Copper; Electrolytic Assay of — G. L. Heath.
J. Amer. Chem. Soc., 1904, 26, 1120—1124.

IN carrying out the following processes for the exact determination of copper, the weighing out of large quantities of substance, up to 5 grms., is advocated. The figures given, however, refer to 1 grm. of substance. For metal containing arsenic and antimony, but less than 0.01 per cent. of nickel, cobalt, and zinc together, dissolve in 10 c.c. of nitric acid, evaporate with 10 c.c. of concentrated sulphuric acid until the residue is white, take up with 70 c.c. of water, add 1 c.c. of nitric acid and just enough ammonia to redissolve, and electrolyse. For metal containing much selenium and tellurium, but only traces of antimony, and less than 0.02 per cent. of arsenic, treat with nitric and sulphuric acids as above, dissolve in 60 c.c. of water, heat nearly to boiling, pass in pure sulphur dioxide for 10 minutes, settle overnight, filter, and boil off the sulphurous acid. Ignite the filter, dissolve the ash in 1.5 c.c. of nitric acid, add to bulk of liquid, and electrolyse. For metal containing over 0.01 per cent. of antimony and other elements, heat with nitric and sulphuric acids, dissolve in 70 c.c. of water, add 1 c.c. of ferric nitrate solution (1 c.c. = 0.01 grm. of iron), boil, precipitate with ammonia, filter, and wash. Dissolve in dilute sulphuric acid and re-precipitate, adding filtrate to bulk. Redissolve and pass sulphuretted hydrogen, extract the precipitate with a little hot dilute sodium sulphide, ignite, dissolve in 1.5 c.c. of concentrated nitric acid, and add to bulk. Acidify the collected liquors with sulphuric acid, concentrate to a suitable volume, and electrolyse. For metal containing much arsenic, but at most 0.01 per cent. of antimony, dissolve 5 grms. of the copper in nitric acid, dilute to 50 c.c. and add 3 c.c. of concentrated sulphuric acid. Add ammonia until a slight permanent precipitate forms, redissolve by 1 c.c. of sulphuric acid (sp. gr. 1.84), and stir in dry powdered ammonium nitrate to saturation, and electrolyse.

—W. A. C.

ORGANIC—QUALITATIVE.

Fatty Oils; Colour Reactions of — [Lignin Reaction].
H. Kreis. Chem.-Zeit., 1904, 28, 956—957.

AN account is given of further experiments with the phenoloid substance, sesamol (this J., 1903, 575, 1210). Sesamol oil thoroughly shaken with successive portions of cold alcohol did not give the characteristic colour reaction with diazonaphthionic acid (termed by the author the "sesazo reaction") nor did it give the green coloration with nitric acid (sp. gr. 1.4), though it still reacted with resorcinol (after about one minute), and with stannous chloride, phosphomolybdic acid, and solution of vanadic acid in sulphuric acid. On distillation of the alcoholic extract a dark brown oily liquid consisting in the main of fatty acids was left. The fatty acids were converted into calcium salts and filtered off, and the filtrate shaken with ether. The ethereal extract on evaporation left about 0.5 c.c. of a viscous dark brown oil (from 1.5 kilos. of sesamol oil) which could not be distilled under reduced pressure. It gave the following reactions in addition to those already described (*loc. cit.*). (1) It was soluble in concentrated sulphuric acid, yielding a dark green solution. (2) An ethereal solution of sesamol shaken with seed oils and nitric acid (sp. gr. 1.4) gave a green coloration which speedily disappeared. (3) A pine-wood chip impregnated with sesamol and then dipped into hydrochloric acid (sp. gr. 1.19) gave an intense green coloration. This new reaction of lignin could also be obtained directly with sesamol oil. There appears to be a close relationship between the lignin reaction and Kreis's reaction for fats that have been exposed to light. In both cases the reaction is to be attributed to the action of phenols

Lignin Reaction. Kreis's Reaction.

Resorcinol.....	Violet	Violet
Phloroglucinol.....	Red	Red
Pyrogallol.....	Violet	Violet
Hydroxyhydroquinone.....	Green	Green
Naphthoresorcinol.....	Violet	Green
Sesamol.....	Green	Green

on aldehydes in the presence of strong hydrochloric acid. The colorations given by different phenols in the two reactions show a close agreement, except in the case of naphthoresorcinol. The analogy between the two reactions even extends to aniline, for on shaking cottonseed oil (after exposure to light) with a drop of aniline and hydrochloric acid of sp. gr. 1.19, a perceptible yellow coloration was produced. (See this J., 1839, 1158; 1904, 194.)

—C. A. M.

Wool-Fat Oleines [Detection of Mineral and Rosin Oils in —]. J. Marcusson. Mitt. königl. Materialprüfungsamt, 1904, 22, 96—110. Chem. Zeit., 1904, 28, Rep. 283.

THE insoluble residue left after boiling the unsaponifiable constituents of wool-fat oleines (see this J., 1903, 825) with acetic anhydride, gave the Hager-Salkowski and Liebermann's reactions, and would thus appear to contain higher alcohols or their derivatives (see Lewkowitsch, this J., 1892, 134). The residue resembles the cholesterolenes in that (1) it gives the two colour reactions mentioned, (2) it rotates the plane of polarisation from + 18° to + 28°, and (3) it absorbs considerable quantities of iodine (iodine value, 59—79). These properties clearly differentiate it from mineral oil; moreover, analysis showed that it contains 4.23 per cent. of oxygen.

Detection of Mineral Oil.—Mineral oil has seldom an iodine value higher than 14, and its rotatory power is at the most $[\alpha]_D = + 3.1^\circ$. If, therefore, the insoluble residue left after boiling the unsaponifiable matter with acetic anhydride has an iodine value much lower than 60, and a rotatory power less than + 18°, the presence of mineral oil is to be suspected.

Detection of Rosin Oil.—The presence of rosin oil in the residue insoluble in acetic anhydride can be recognised by: (1) its characteristic odour; (2) increased specific gravity (rosin oil, 0.97—0.98; wool-fat residue, 0.905—0.912); (3) increased solubility in alcohol; and (4) determination of the refractive index of the portion dissolved by an equal volume of 96 per cent. alcohol. With wool-fat residue, the refractive index would be from 1.5 to 1.53, but in presence of rosin oil, higher figures would be obtained.

—R. L. J.

Keto-Hexoses; Reaction for —. H. J. H. Fenton. Brit. Assoc., 1904. Chem. News, 1904, 90, 182.

THE author finds that if levulose, cane-sugar, inulin, or sorbose be oxidised in presence of ferrous iron at 90—100° C., and the resulting solution be heated with phenylhydrazine-*p*-sulphonic acid, a compound is obtained which dyes silk a fast, brownish-pink colour. It is stated that the reaction appears to be characteristic of keto-hexoses or substances which yield them on hydrolysis, and is given only to a limited extent or not at all by dextrose, milk-sugar, maltose, or starch.—A. S.

Methylfurfural and its Derivatives; Colour Reaction for —. H. J. H. Fenton and J. P. Millington. Brit. Assoc., 1904. Chem. News, 1904, 90, 182.

METHYLFURFURAL and its bromo-, chloro-, iodo-, or acetoxy-derivatives give an intensely blue-coloured compound when heated with dimethylaniline and a dehydrating agent, such as phosphorus oxychloride, zinc chloride, or anhydrous oxalic acid. The reaction is stated to be an extremely sensitive one.—A. S.

Picrates of Unsaturated Compounds. G. Bruni and E. Tornani. Atti. R. Accad. dei Lincei Roma, 1904, 13, [2], 184—187. Chem. Centr., 1904, 2, 954—955.

EXPERIMENTS with methyl- and isomethyleugenol, safrol and isosafrol, apiol and iso-apol, and usaron, showed that the behaviour towards picric acid affords a simple means of determining whether an unsaturated aromatic compound contains an allyl or a propenyl group in the side chain. Unsaturated compounds containing an allyl (CH_2CH_2) group in the side chain (methyleugenol, safrol, apiol) do not combine with picric acid. Compounds containing a propenyl (CH_2CHCH_3) group in the side chain, on the other hand, react readily, a red to reddish-brown coloration

being produced when their solutions are treated with picric acid. Compounds containing a dioxymethylene ($\text{C}_6\text{H}_2\text{O}_2$) group (isosafrinol and iso-apinol) yield well-crystallised relatively stable picrates, which may be used for their isolation and identification. Isomethyleugenol and asarone give less stable and badly-crystallising picrates. The following compounds were isolated and examined:—Isomethyleugenol picrate, $\text{C}_{17}\text{H}_{17}\text{O}_9\text{N}_3$, reddish-brown needles, m. pt. $40^\circ\text{--}45^\circ\text{C.}$; it rapidly decomposes. Asarone picrate, $\text{C}_{18}\text{H}_{18}\text{O}_{10}\text{N}_3$, dark-brown needles, m. pt. $81^\circ\text{--}82^\circ\text{C.}$ Isosafrinol picrate, $\text{C}_{16}\text{H}_{15}\text{O}_9\text{N}_3$, glistening red needles, m. pt. 78°C. Iso-apinol picrate, $\text{C}_{18}\text{H}_{17}\text{O}_{11}\text{N}_3$, fine reddish-brown needles, m. pt. $89^\circ\text{--}90^\circ\text{C.}$ Anethiso-apinol, $\text{C}_{18}\text{H}_{17}\text{O}_{11}\text{N}_3$, red, needle-shaped prisms, m. pt. 81°C. —A. S.

ORGANIC—QUANTITATIVE.

Bacterioscopic Examination of Water; Standardisation of Methods for the —. Report of the Committee appointed at the Congress of the Royal Inst. of Public Health, July, 1903. *J. of State Medicine*, Aug., 1904. *Chem. News*, 1904, 90, 177—179.

THE committee recommend that there should be undertaken in all cases:—(a) Enumeration of the bacteria present on a medium incubated at room temperature ($18^\circ\text{--}22^\circ\text{C.}$). (b) Search for *B. coli* and identification and enumeration of this organism if present. The majority of the committee recommend in addition:—(c) Enumeration of the bacteria present on a medium incubated at blood heat ($36^\circ\text{--}38^\circ\text{C.}$). (d) Search for and enumeration of streptococci. In special cases it may also be advisable to search for *B. enteritidis sporogenes*. *Collection of the Sample*.—The sample should be collected in the usual manner in sterile stoppered bottles having a minimal capacity of 60 c.c. If not examined within three hours of the time of collection, the bottles must be packed in ice.

Media to be Employed for Enumeration.—For enumeration at room temperature, distilled water gelatin, nutrient gelatin, distilled water agar, gelatin agar, or nutrient agar may be employed, but for enumeration at blood-heat an agar or gelatin agar must be used. When gelatin only is employed, this should be nutrient gelatin, but the use of distilled water gelatin also is to be preferred.

Preparation and Reaction of Media for Enumeration.—(a) *Distilled Water Gelatin*.—A 10 per cent. solution of gelatin in distilled water, brought to a reaction of + 10 (Eyre's scale). (b) *Nutrient Gelatin*.—A 10 per cent. solution of gelatin, containing meat (beef) infusion and Witte's peptone and brought to a reaction of + 10. (c) For enumeration at blood heat, the use of nutrient agar is recommended; it is prepared in the same manner as nutrient gelatin, except that 1.5 per cent. of powdered agar is substituted for the gelatin. (d) *Distilled Water Agar*.—A 1.5 per cent. solution of agar in distilled water, brought to a reaction of + 10.

Amounts to be Plated, Size of Dishes, &c., Gelatin.—For an ordinary water, amounts of 0.2, 0.3, and 0.5 c.c. may be "plated" in Petri dishes of not less than 10 cm. diameter. It is recommended to make duplicates in all cases. *Agar*.—Two plates may be made with 0.1 and 1.0 c.c. of the water respectively. The amount of the medium in a plate should be 10 c.c.

Counting.—Counting should be done with the naked eye, preferably in daylight, any doubtful colony being determined with the aid of a lens or low-power objective. Gelatin cultures should be counted at the end of 72 hours, or earlier if necessary on account of liquefaction; agar cultures incubated at blood-heat should be counted after 40—48 hours.

Search for *Bacillus Coli*.—Either the glucose formate broth method of Pakes or the bile salt broth method of McCoukey is recommended, with anaerobic incubation at 42°C. Fifty c.c. should be the minimal quantity of water examined for the presence of *B. coli*, separate quantities from a minimum of 0.1 c.c. to a maximum of 25 c.c. being added directly to the tubes of culture media, without previous filtration through a porcelain filter. If indications of the presence of *B. coli* be obtained, the organism must be isolated by making surface cultures on

litmus lactose agar of reaction + 10, bile salt agar, nutrient gelatin, or Conradi and Drigalski's nutrose agar, preferably the last-named; and then identified by making sub-cultures on surface agar at 37°C. , in gelatin (stab and surface cultures), in litmus milk incubated at 37°C. , in glucose litmus medium, in lactose litmus medium, and in peptone water (for indole reaction). The typical *B. coli* must conform to the following description and tests. It is a small, motile, non-sporing bacillus, growing at 37°C. as well as at room temperature. The motility is well observed in a young culture in a fluid glucose medium. It is decolorised by Gram's method of staining. It never liquefies gelatin; the gelatin cultures should be kept for at least 10 days in order to exclude liquefying bacilli. It forms smooth, thin surface growths and colonies on gelatin, not corrugated, and growing well to the bottom of the stab (facultative anaerobe). It produces permanent acidity in milk, which latter is curdled within seven days at 37°C. It ferments glucose and lactose, with the production both of acid and gas.

***Streptococci*.**—It is advantageous to search for streptococci by making hanging-drop preparations of the fluid media employed for the preliminary cultivation of *B. coli*. Any streptococci detected should be isolated on nutrose agar plates and their characters determined.—A. S.

Nicotine; Determination of — in presence of Pyridine [in Sheep Dips, &c.]. J. A. Emery. *J. Amer. Chem. Soc.*, 1904, 26, 1118—1119.

A WEIGHED quantity (2.5 grms.) of the sheep-dip, tobacco-extract, tobacco powder, &c. is placed in a 300 c.c. flask with 50 c.c. of N 10 caustic soda and 150 c.c. of distilled water and distilled in a current of steam, in the usual way, until 10—20 c.c. of liquid remain. The distillate is made up to 500 c.c. and a portion examined in a 40 cm. tube and a polariscope reading taken. Each -1° on the sugar scale represents 0.112 per cent. of nicotine in the distillate.

—W. A. C.

Nux Vomica Extract; Official Process for —, in the forthcoming [French] Codex. E. Bourquelot. *XX*, page 998.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Zinc Sulphide; Phosphorescent —. H. Grune. *Ber.*, 1904, 37, 3076—3077.

To prepare Sidot's blende the author has tried the method of Henry (Comptes rend., 115, 505:—A neutral solution of zinc chloride is precipitated with ammonia, the precipitate re-dissolved in excess, and exactly precipitated with hydrogen sulphide. The zinc sulphide is washed, dried, heated to whiteness in a fire-clay crucible inside a charcoal-lined graphite crucible.) Henry lays stress on the purity of the zinc chloride used, but the author obtained most variable results, and concluded that the brilliancy of the phosphorescence was probably due to minute traces of impurities. By purposely adding traces of other metals, he was able to prepare strongly phosphorescent sulphide with certainty. Copper, to the extent of 0.01 per cent., was the metal which gave best results, but good phosphorescence was obtained by adding silver, lead, bismuth, tin, uranium, or cadmium; none by adding iron, nickel, cobalt, or chromium. In the case of manganese, the sulphide produced gave a yellowish-red phosphorescence after illumination; but rubbing or scratching produced an extraordinarily brilliant light, visible even in daylight. Certain natural blendes have been found to phosphoresce on scratching, no doubt because of containing small proportions of manganese. The property of causing this phosphorescence in zinc sulphide is possessed by other metals, such as copper and uranium, but in much lower degree than by manganese.

—J. T. D.

Phosphorescent Substances. K. A. Hofmann and W. Duca. *Ber.*, 1904, 37, 3407—3411.

In preparing Sidot's blende the authors found that, following Henry's method, they could obtain no phosphorescent product from pure materials, though the zinc

chloride of commerce yielded very satisfactory products. As the result of their investigation into the influence of various impurities on the phosphorescence, they give the following method for preparing a blende with intense yellowish green phosphorescence. To the solution in 400 c.c. of water, slightly acidified with sulphuric acid, of 20 grms. of zinc ammonium sulphate, 5 grms. of sodium chloride, and 0.2—0.5 gm. of crystallised magnesium chloride, add 100 c.c. of 8 per cent. ammonia; allow to stand 24 hours, filter, saturate with hydrogen sulphide, filter, drain the filter, and precipitate (without washing) on porous tiles, and dry at 100° C. Powder finely and heat to whiteness in a covered porcelain crucible contained in an outer fire-clay crucible. The product is very sensitive both to light (though exposure to red light extinguishes its phosphorescence) and to α -radio-active substances. Neither magnesium compounds nor potassium compounds alone give a sensitive product. Of other impurities, iron, nickel, cobalt, bismuth, chromium, and copper were objectionable; but tin, selenium, manganese, and cadmium give sensitive products. In especial, the addition to the ammoniacal filtrate above obtained, before precipitation, of manganese chloride equal in weight to 1/1000 of the zinc ammonium sulphate gave a product with brilliant golden-yellow phosphorescence. None of the phosphorescent blends prepared by the authors emitted any α - or β -Bequerel rays. (Compare preceding abstract.)—J. T. D.

Sidot's Blende; Phosphorescence of —, under the influence of Ozone. R. Schenck and F. Mihr. Ber., 1904, 37, 3464—3467.

SIDOT'S blende was found to be very weakly luminous, and to give feeble scintillations, in the dark. The passage over it of a stream of ozonised oxygen caused not only a great increase in the homogeneous luminosity, but also an increase in the intensity of the scintillations. Exposure to weak light, such as that of a lucifer match, also increases the intensity of scintillation. Other investigations have shown that the scintillation is influenced by other circumstances, and it would seem that any cause which increases the intensity of the homogeneous illumination also increases that of the scintillation. Increase of intensity of the scintillation of Sidot's blende is therefore not to be taken without caution as evidence of the presence of radio-active substances. Blende which has been often exposed to ozone ceases to show homogeneous luminosity, but still shows scintillation clearly. (Compare the two preceding abstracts.)—J. T. D.

Cinnabar; Radio-active —. S. M. Losanitsch. Ber., 1904, 37, 2904—2906.

SAMPLES of Servian cinnabar (from Avala and Bare) were found to affect a photographic plate when placed upon it for three or four days in a lead box with a paper bottom. Some of the Idrian cinnabar, especially the variety known as "Ziegelelz," was found to exhibit similar activity, but all other specimens examined were inactive. The activity was much less marked than that of pitchblende; it was proved not to be due to metallic mercury contained in the cinnabar, nor to the barium compounds associated with it. From the latter circumstance the author concludes that it is not due to radium (which would have been with the barium compounds rather than with the cinnabar), and attributes it to "radiomercury" a hypothetical element of higher atomic weight than mercury in the zinc-cadmium-mercury homologous series. He considers that all of these homologous series of elements end in radio-active elements, but that the radio-activity of the upper elements diminishes in intensity as the series become less electro-positive.

—J. T. D.

Petroleum; Radio-active Gas from Crude —. E. F. Burton. Phil. Mag., 1904, 8, 498—508.

By drawing a current of air through heated crude petroleum (obtained from wells in Petrolia, Ontario), a strongly radio-active gas was obtained, very similar in its rate of decay, and also in the rate of decay of the induced radio-activity which it produces, to the emanations from radium, mercury,

and from certain natural mineral waters. The radio-activity of this gas diminishes according to an exponential law, and falling to half value in 3.125 days, whilst the induced radio-activity which it produces falls to half value in about 35 minutes. Indications were also obtained of the existence in crude petroleum of traces of a radio-active substance more persistent than the radium emanations; it is thought that this substance may possibly be radium itself.

—T. F. B.

Rays of Short Wave-Length; Chemical Action of — on Gaseous Bodies. E. Warburg and E. Regener. Sitzungsber. Kgl. pr. Akad. Wiss. Berlin, 1904, 1228—1231. Chem. Centr., 1904, 2, 873.

It has been previously shown (Ann. der Physik, 13, 464) that the formation of ozone by means of the silent electric discharge, is not an electrolytic but a photo- and cathodo-chemical action. The fact that rays of short wave-length can cause the formation of ozone, led the authors to examine their influence in other chemical processes. It was found that rays of short wave-length can also exercise a de-ozonising action. The curves showing the ozonisation and de-ozonisation intersected at a point representing an ozonisation of 2.2 per cent., but this point of equilibrium varied with the permeability of the quartz-glass used, for the ozonising and de-ozonising rays. Rays of short wave-length can also effect the decomposition of ammonia, nitric oxide (into nitrous oxide and oxygen) and nitrous oxide (formation of nitrogen peroxide); in an experiment with ammonia, 10 per cent. was decomposed in 80 minutes.—A. S.

Platinic Sulphate; Analysis of Margules' —. L. Stuehlik. Ber., 1904, 37, 2913—2915.

MARGULES, by the action of alternating currents, dissolved platinum in strong sulphuric acid (this J., 1899, 376), and has since succeeded in crystallising the substance formed, which he assumed to be platinic sulphate. The author has analysed Margules' recrystallised substance, reducing the platinum by passing hydrogen through the solution, filtering, and determining the sulphuric acid in the filtrate. The results showed a considerable excess of sulphuric acid; but by two or three recrystallisations crystals were obtained agreeing closely in composition with the formula $\text{Pt}(\text{SO}_4)_2 \cdot 4\text{H}_2\text{O}$. These orange-yellow crystals readily lose water at the ordinary temperature *in vacuo* over sulphuric acid, darkening in colour, whilst the salt with excess of sulphuric acid loses but little even at 100° C. Both the hydrated and the anhydrous salts are very soluble in water; from the dark-coloured solution of the anhydrous salt sulphuric acid precipitates yellow crystals, probably of the hydrated salt.—J. T. D.

Light; Chemical Action of —. F. Sachs and S. Hilpert. Ber., 1904, 37, 3425—3431.

As a general rule, it is found that aromatic compounds which have a nitro-group in the ortho-position to a CH group are sensitive to light. It has already been shown (this J., 1904, 341, and Ber. 1902, 2704) that *o*-nitrobenzaldehyde and *o*-nitrobenzaniline are converted, on exposure to light, into *o*-nitrosobenzoic acid and *o*-nitrosobenzanilide respectively. In the other reactions studied, the nitro-group was always reduced to a nitroso group. On exposing a benzene solution of *o*-nitrobenzyl alcohol to light, a green coloration soon appeared, and a yellow precipitate formed; this had the empirical composition $\text{C}_6\text{H}_4 \cdot \text{CH}(\text{NO})_2$, but it had a high molecular weight, and has not been identified: that a nitroso compound was formed during the reaction was proved by the evolution of nitrogen when *o*-nitrobenzyl alcohol and phenylhydrazine were exposed to the action of light in acetic acid solution. Similarly, *o*-nitrobenzaldehyde cyanhydrin gave an unstable intermediate nitroso compound, which decomposed into hydrocyanic acid and *o*-nitrosobenzoic acid. *o*-Nitrophenyllactic acid ketone, *o*-nitrobenzylamine derivatives, *o*-nitrobenzyl acetate, *o*-nitrobenzyl chloride, and even *o*-nitrotoluene to a small extent, decomposed under the influence of light, the green colour of the resulting solutions indicating the probable formation of nitroso compounds.—T. F. B.

Sugars; Acyl-Hydrazones of — R. Kahl. Z. Vereins deutsch. Zuckerind., 1901, 1091—1119.

THE hydrazones obtained by acting on sugars with acyl-hydrazides have the advantage over osazones of permitting the sugar to be regenerated (by means of benzaldehyde or formaldehyde) and over the simpler hydrazones of being less soluble and therefore easily isolated. To the five examples prepared by Radenhausen and by Herzfeld, the author adds eleven new ones, applying *p*-bromobenz-hydrazide, *p*-chlorobenzhydrazide, salicylhydrazide, and β -naphthylsulphonic-hydrazide. Ketoses do not form hydrazones of this kind and can thus be separated from aldoses. Only those hydrazides seem to react which have the CO.NH.NHR radical attached directly to the benzene ring. Several semicarbazones of sugars are also described, and it is shown that semicarbazide fails to react with ketoses.—W. A. C.

Saponarin: a Glucoside coloured Blue by Iodine. G. Barger. Brit. Assoc., 1904. Chem. News, 1904, 90, 183—184.

THE author isolated the glucoside *saponarin*, known to botanists as "soluble starch," from *Saponaria officinalis*. It was obtained in minute needles by crystallising from mixtures of pyridine and water. It is insoluble in water and in most organic solvents, but readily soluble in dilute alkalis and in pyridine; it melts at 231° C. with decomposition. When its yellow solution in alkali is acidified, the substance remains for a long time in a state of pseudo-solution, and in this condition it gives an intense blue or violet coloration with iodine dissolved in potassium iodide solution. Air-dried crystals of saponarin lose water when heated or when left *in vacuo* over sulphuric acid; the anhydrous substance is extremely hygroscopic. By hydrolysis with mineral acids, glucose is produced, together with a second substance, *saponaretin*, which separates from strong solutions as a thick yellow oil, and from dilute solutions either in the amorphous condition, or crystallised. *Saponaretin* appears to be closely allied to the flavones. When fused with caustic potash, it yields *p*-hydroxybenzoic acid, and a red solution which gives the phloroglucinol reaction with "pinewood."—A. S.

Lactase; Occurrence of — in Plants. A. Brachin. J. Pharm. Chim., 1904, 20, 300—308.

LACTASE is found to be present in a large number of plants, those examined including members of the natural orders Rosaceae, Cruciferae, Cornaceae, and Rutaceae. It is not found in certain individuals, such as *Evonymus europaeus*, *Capparis spinosa*, *Berberis vulgaris*, nor in the mould *Aspergillus niger*, nor in *B. coli communis*. The specific nature of the ferment, as recorded by Bourquelot and Hérissé, is confirmed. It is destroyed at 75° to 80° C., a temperature 10° C. lower than is fatal to emulsin. The presence of 0.24 per cent. of acetic acid is sufficient to arrest its action, whilst emulsin requires the presence of 1.25 per cent. of that acid to arrest its fermentative activity. Sulphuric acid in the proportion of 0.09 to 0.10 grm. per litre arrests the action of lactase, and oxalic acid is almost as energetic in this direction; it requires, however, about 7.5 grm. per litre of tartaric acid to arrest lactic fermentation. Lactase behaves differently from myrosin in that it has no action on potassium myronate.—J. O. B.

New Books.

L'OZONE ET SES APPLICATIONS INDUSTRIELLES. Par H. DE LA COUX, Inspecteur de l'Enseignement tech. au Ministère du Commerce, Expert près le Conseil de Préfecture de la Seine, &c. Vve. Ch. Dunod, 49, Quai des Grands-Augustins, 49, Paris. 1904. Price 15 fr.

LARGE 8vo volume, containing 245 pages of subject-matter, with 159 illustrations. The subject in this work is treated under the following heads:—I. THE PHYSICAL AND PHYSIOLOGICAL PROPERTIES OF OZONE. (i) The Phenomena of Oxidation in Nature, and the Chemical Activity of Ozone in relation to the Industries. (ii) Nature of Ozone, and its Physical Properties. (iii) Ozone in the Air. (iv)

Action of Ozone on the Organism. (v) Therapeutic Action of Ozone. II. PRODUCTION OF OZONE. (i) Preparation of Ozone by Gentle Oxidation, Heat, and Radio-active Salts. (ii) By Chemical Processes. (iii) By Electro-chemical Methods. (iv) By the Electric Discharge. III. INDUSTRIAL APPLICATIONS OF OZONE: ITS CHEMICAL AND MICROBIOLOGICAL ACTION. (i) Chemical Action of Ozone, and its Utilisation in the Manufacture of Chemical Products. (ii) Action of Ozone on the Air; Disinfection and Sterilisation. (iii) Sterilising and other Action of Ozone on Water. (iv) Action on Organic Products of Animal Origin, and their Preservation. (v) Action in Purifying and Maturing Alcoholic Products, Brandies and Spirits. (vi) Action in Improving and Maturing Wines. (vii to xi) Ozone in the Manufacture and Preservation of Vinegar, in Brewing, in Cider Making, in the Distillery, in Sugar Manufacture. (xii) Ozone in Bleaching. (xiii to xxii) In Starch and Dextrin Making; in the Manufacture of Oils and Fats, Soaps, Drying Oils, Varnishes, &c., Dyestuffs, Artificial Perfumes, Maturing Wood, Sericulture, Bleaching, Disinfection, Photography, &c. IV. ANALYSES. (i) Testing Ozone with Reagents and Test Papers. (ii) Determination of Ozone by Volumetric Methods. (iii) Determining Ozone by Physical Methods.

THE ELECTRIC FURNACE. By HENRI MOISSAN. Translated by A. T. DE MOUILPIED, Ph.D. Edw. Arnold, 41 and 43, Maddox Street, Bond Street, London. W. 1904. Price 10s. 6d.

8vo volume, containing preface, translator's notes, introduction, 303 pages of subject-matter, with 42 illustrations, and the alphabetical index. The following are the leading themes, in the treatment of this subject:—I. The Different Types of Electric Furnace. Crystallisation of Metallic Oxides. Fusion and Volatilisation of some Refractory Substances. II. Researches on the Different Varieties of Carbon. III. Preparation of Various Elements in the Electric Furnace. IV. Study of Carbides, Silicides, Borides, Phosphides, and Arsenides. V. Recent Researches on Carbides, Silicides, and Borides: (a) Carbides of Neodymium and Praseodymium and Samarium. (b) Silicides of Vanadium and Cerium. (c) Borides of Silicon.

LABORATORY STUDIES FOR BREWING STUDENTS. A Systematic Course of Practical Work in the Scientific Principles Underlying the Processes of Malting and Brewing. By ADRIAN J. BROWN, M.Sc., Professor of the Biology and Chemistry of Fermentation in the University of Birmingham, &c. Longmans, Green, and Co., 39, Paternoster Row, London; New York and Bombay. 1904. Price 7s. 6d.

THIS volume, 8vo size, contains preface, 186 pages of subject-matter, 36 illustrations, and six tables. The whole subject is treated under the following sections:—I. Barley and Malting. II. Principles of the Mashing Process. III. Fermentation. IV. The Hop.

THE ANALYSTS' LABORATORY COMPANION. A Collection of Tables and Data for the Use of Public and General Analysts, Agricultural, Brewers', and Works' Chemists, and Students; together with numerous examples of Chemical Calculations and Concise Descriptions of several Analytical Processes. By ALFRED E. JOHNSON, B.Sc. Third Edition. J. and A. Churchill, 7, Great Marlborough Street, London. 1904. Price 6s. 6d.

SMALL 8vo volume, with preface, 146 pages of data, tables, methods, formulae, &c., interleaved with ruled, blank sheets for notes. At the end of the volume there is an alphabetical index. Among the tables, &c. are the following, as examples:—Atomic Weights and Logarithmic Tables. Multipliers and their Logarithms required in Gravimetric Analysis. Factors required in Volumetric Analysis. Nitrometer Analysis, &c. Notes on Indicators. Precipitating Powers of Common Reagents. Density Tables. Table of Freezing Mixtures. Percentage Conversion, into cwt., qrs., lb. per ton, &c., and the reverse. Barometric Tables. Specific Gravity and Hydrometer Tables. Water and Beer Analysis Tables. Alcohol, Phosphate, Ammonia, Albuminoid, Kjeldahl, and Electro-Chemical Equivalents.

Tables. Tables of Constants of Oils, Fats, and Waxes. Calculation of Results of Milk Analysis. Variations in Reichert - Wollny Number, &c. of Butter and Margarine. Physical and Chemical Criteria in the Analysis of Butter-Fat. Table of Electro-chemical Equivalents, Thermometric Tables, and Scale Conversions, &c.

TABLES FOR QUALITATIVE CHEMICAL ANALYSIS, ARRANGED FOR THE USE OF STUDENTS. By A. LIVERSIDGE, M.A., LL.D., F.R.S. Professor of Chemistry in the University of Sydney. Second Edition. Macmillan and Co., Ltd., London. 1904. Price 4s. 6d. net.

LARGE 8vo volume, containing introduction and 110 pages of tabulated analytical matter, an appendix of 13 pages, and an alphabetical index. It may be pointed out that qualitative methods in this work are extended to organic substances and compounds not usually included under ordinary qualitative analysis. Thus the alcohols, aldehydes, acetone, chloroform, and glycerol are included. Also the carbohydrates, glucosides, and certain aromatic compounds and volatile bases.

Trade Report.

I.—GENERAL.

TUNIS; EXPORT TRADE OF — IN 1903.

Foreign Office Annual Series, No. 3295.

The following figures give the quantity and value of the exports of certain articles from Tunis during 1902 and 1903; the figures for 1902 are given in brackets:—

Lead, 13,405 tons, 43,583*l.* (14,343 tons, 46,631*l.*); olive oil, 4872 tons, 113,708*l.* (4064 tons, 102,404*l.*); phosphates, 353,835 tons, 359,496*l.* (257,546 tons, 261,667*l.*); soap, 326 tons, 5304*l.* (917 tons, 14,913*l.*); tan, 4574 tons, 55,778*l.* (5620 tons, 68,526*l.*); raw wax, 67 tons, 4788*l.* (79 tons, 5626*l.*); zinc ore, 24,061 tons, 97,784*l.* (37,466 tons, 152,264*l.*).

PERU; TRADE OF —.

Foreign Office Annual Series, No. 3231.

The subjoined table gives details of certain exports from Peru during the Years 1901—1903:—

Articles.	Quantity.			Character of Trade.
	1901.	1902.	1903.	
Calcium borate	Tons. 4,694	Tons. 4,975	Tons. 2,282	Exported principally to United Kingdom.
Coca	601	919	1,026	Chiefly to Germany and United States.
Cocaine	10 10 ton cwt. ton cwt.	8 3 ton cwt. ton cwt.	7 14 ton cwt. ton cwt.	Exported almost entirely to Germany.
Cottonseed ...	1,735	4,305	5,264	Exported to United Kingdom and Germany.
Cotton-seed oil cakes.	1,171	2,301	2,213	Chiefly to United Kingdom.
Guano	29,920	52,904	21,336	The whole exported on British account and the bulk shipped to United Kingdom.
Hides and skins.	2,218	2,064	2,653	Chiefly to France, Germany, and United States.
Ores, sulphides, and matte.	40,192	40,702	37,086	Principally to United Kingdom.
Rubber	1,726	1,674	2,075	Exported chiefly to United Kingdom and France.
Silver bars	77 0 Galls.	35 18 Galls.	106 10 Galls.	Principally to United Kingdom and France.
Spirits	149,157	293,146	368,380	Almost entirely to Bolivia and Chile.
Sugar	112,942	115,513	125,662	Chiefly to United Kingdom, Chile, and United States.

The subjoined table shows the value of certain imports into Peru through Pacific Ports during the years 1902 and 1903:—

Articles.	Value.		Character of Trade.
	1902.	1903.	
Bone, horn, and celluloid articles.	£ 17,118	£ 4,001	Chiefly from United Kingdom and Germany.
Candles, wax, and stearine	23,942	43,374	Chiefly from Belgium and United Kingdom.
Cardboard and its manufactures.	7,830	4,975	Principally from Germany.
Coal	92,901	122,742	From United Kingdom, Australia, and United States.
Cement	14,405	21,603	From Germany, Belgium, United States, and Chile.
Drugs, chemical products, mineral waters, and surgical instruments.	105,045	126,888	The bulk comes from United Kingdom, France, Germany, and United States.
Dyeing and tanning stuffs.	23,813	23,741	From United Kingdom, Germany, Belgium, and Chile.
Earthen and stone wares, porcelain, glassware, fire-bricks, bottles, marble, alabaster, glass, and manufactures thereof.	76,360	84,760	Principally from United Kingdom, Germany, United States, and Belgium.
Explosives	30,110	27,030	Chiefly from Germany and United States.
Metals and manufactures thereof.	414,049	933,731	Principally from United Kingdom, Germany, France, and United States.
Oils of all kinds	44,960	56,846	United Kingdom, United States, and Italy.
Paint and varnishes	14,968	15,969	Chiefly from United Kingdom and Germany.
Perfumery	14,365	19,062	Comes principally from United Kingdom, France, Germany, and United States.
Soap	3,843	5,073	Chiefly from France, Germany, and United Kingdom.

CRETE; TRADE OF — DURING 1903.

Foreign Office Annual Series, No. 3282.

The subjoined table gives details of trade in Crete during 1902 and 1903 in certain articles:—

Articles.	Exports.		Imports.	
	1902.	1903.	1902.	1903.
	£	£	£	£
Olives and products of olives	106,685	*208,396	1,558	2,523.
Timber and wood products	882	712	19,899	24,219
Vegetable dyes, &c.	9,956	11,796	2,352	2,542
Raw minerals and metals	1,990	2,785	23,004	20,750
Drugs and chemicals	32,594	37,159	14,164	15,404
Prepared skins	426	320	29,797	37,980
Sugar, sweetmeats, &c.	65	38	16,535	17,515
Wines and liquors.	16,914	21,795	6,534	7,569
Pottery and glassware .	26	15	9,634	1,012

* Includes olive oil, 40,500*l.*

ORANGE RIVER COLONY; TRADE OF —.

Chem. and Druggist, Oct. 1, 1904.

Among articles imported into the colony during the year ending June 30, 1904, were the following, the figures in parentheses referring to those of 1902-3:—Acetic acid, 140*l.* (132*l.*); drugs and chemicals, 23,095*l.* (22,342*l.*); extracts and essences, 2,036*l.* (2,197*l.*); essential and perfumed oils, 170*l.* (91*l.*); all other descriptions of oils,

17,805*l.* (10,764*l.*); paints, colours, turpentine, and varnish, 14,879*l.* (8,467*l.*); common soap, 19,970*l.* (15,288*l.*); imported spirits, 38,212*l.* (48,517*l.*); and spirits manufactured in Cape Colony, 14,900*l.* (13,582*l.*).

BRAZIL; EXPORT TRADE OF —.

Foreign Office Annual Series, No. 3283.

The subjoined table gives quantity and value of certain exports from Brazil during the years 1902—1903 :—

Articles.	Quantity.		Value.	
	1902.	1903.	1902.	1903.
	Met. Tons.	Met. Tons.	£	£
Monazite sands	1,295	3,209	53,661	74,139
Sugar	136,757	21,889	953,405	193,540
Castor seed	2,387	4,045	19,436	30,928
Rubber—				
Mangabeira	359	661	45,711	94,335
Manicoba	807	1,721	132,465	327,836
Seringa	27,474	29,323	7,115,297	9,308,870
Cotton seed	30,396	35,535	92,791	116,707
	Galls.	Galls.		
Para nuts	3,292,620	3,473,910	161,811	190,014
	Met. Tons.	Met. Tons.		
Carnauba wax	1,517	1,025	84,077	131,906
Hides—				
Wet and salted ...	29,354	20,868	707,879	803,769
Dry	6,532	7,489	407,006	455,357
Medicinal herbs and roots	632	589	29,605	25,894
Manganese	157,295	161,926	221,262	248,010
	Oz.	Oz.		
Gold, bar	127,070	135,305	431,706	468,591
Stones, precious			110,540	113,582
	Met. Tons.	Met. Tons.		
Skins	1,936	2,323	413,847	529,355

CHINA; CHEMICAL EXPORTS OF — IN 1902.

Foreign Office Annual Series, No. 3280.

The values of certain Chinese produce shipped abroad in 1903 were as follows :—

Hides, 621,704*l.*; paper, 450,716*l.*; oils (vegetable), 428,273*l.*; chinaware, 290,383*l.*; sesamum seed, 267,492*l.*; tallow, 213,040*l.*; sugar, 130,185*l.*; nutgalls, 100,131*l.*; musk, 67,668*l.*; glassware, 64,960*l.*; oils (essential), 44,435*l.*; white wax, 27,187*l.*

IV.—COLOURING MATTERS AND DYE STUFFS.

DYE STUFFS IN INDIA.

Chem. and Druggist, Oct. 1, 1904.

According to the *Indian Agriculturist*, the imports of aniline and alizarin dyes into India during 1903 were unusually heavy, and surpassed those of any previous year. The quantity of 12,182,600 lb. is one-third as much again as in 1902-3, but owing to a considerable fall in the average price of aniline dyes the value Rs. 82,67,610, was only 26 per cent. higher. The prices of the cheaper alizarin dyestuffs show a very slight decline, and with an increase of nearly 39 per cent. the quantity imported exceeded that of other dyestuffs by 1,216,000 lb. About four-fifths of the trade is with Bombay, and almost the same proportion is recorded as the joint share of Belgium and Holland; but most of this comes through those countries in transit from Germany, which exported to India, in 1902, 2,198,000 kilos. of alizarin, valued at 2,990,900 m., and 1,214,800 kilos. of other coal-tar dyestuffs, valued at 3,766,000 m. This accounts for practically the whole of the alizarin and about 60 per cent. of the remainder.

VII.—ACIDS, ALKALIS, Etc.

POTASH SYNDICATE (GERMANY).

Foreign Office Annual Series, No. 3287.

The Potash Syndicate was renewed on June 30 for a term of five years viz., from January 1, 1905, to December

31, 1909. The syndicate was originally formed in 1879, and renewed from time to time for periods of five years. From 1879 till the end of 1903, the sales amounted in all to 4,100,000 tons of potash (about 8 tons of kainite and 1½ tons of carnallite being reckoned equal to 1 ton of potash); sales steadily increased, the five quinquennial periods participating with 9·4, 10·5, 16·6, 24·6, 38·9 per cent. of the total respectively. Of this quantity, 1,300,000 tons served for industrial and 2,800,000 tons for agricultural purposes.

The syndicate now embraces 27 works, the two largest being in the possession of the Prussian and the Aulst Governments.

The scheme for providing a syndicate fund of 250,000*l.*, with the object of enabling the syndicate to meet outside competition effectively, was abandoned owing to the opposition of the younger works, but it is reported that the older works will raise this fund amongst themselves.

The new agreement of the syndicate divides the products into five groups:—Group I. includes chloritic products containing more than 42 per cent. of potassium, and the so-called 38 per cent. calcined potash manure. Group II.—Sulphate products containing more than 21·5 per cent. of potassium. Group III.—Products of 42—20 per cent. potassium, exclusive of 38 per cent. potash manure, and the sulphate products of Group II. Group IV.—Non-carnallite crude potassic salts containing 19·3 to 12·4 per cent. of potassium. Group V.—Potassic salts, including kieserite.

SALT PRODUCTION; THE WORLD'S —.

Eng. and Mining J., Sept. 22, 1904.

The world produced 13,769,201 short tons of salt in 1902, of which the United States contributed 24·3 per cent.; Great Britain, 15·4 per cent.; Germany, 12·7 per cent.; and India, 8·5 per cent. The balance of 39·1 per cent. was credited to numerous other countries.

BORAX PRODUCTION OF THE UNITED STATES.

Eng. and Mining J., Sept. 22, 1904.

According to the report of the Geological Survey, the amount of crude borax produced in the United States in 1903 was 34,430 short tons, valued at 661,400 dols. The value given is much lower than the total reported for 1902, due to the fact that it is calculated for crude product, whereas last year the valuation was partly for refined borax.

FELSPAR PRODUCTION OF THE UNITED STATES.

Eng. and Mining J., Sept. 22, 1904.

The production in 1903, according to the United States Geological Survey, was 13,432 short tons of crude, valued at 51,036 dols., and 28,459 tons ground felspar, valued at 256,733 dols. In 1902 the output was 21,870 tons crude, valued at 55,501 dols., and 23,417 tons ground felspar, valued at 194,923 dols. Five States were producers—Connecticut, Maine, Maryland, New York, and Pennsylvania.

GRAPHITE PRODUCTION OF THE UNITED STATES.

Eng. and Mining J., Sept. 22, 1904.

In the report of the United States Geological Survey, the production of graphite in the United States during 1903 is given as 37,758 short tons, valued at 1,598,589 dols. Crystalline graphite, the most valuable of the natural varieties, was mined in Essex and Washington counties, N.Y., Chester county, Pa., and Coosa and Clay counties, Ala. The output was 4,538,155 lb., valued at 154,170 dols. The production of amorphous graphite, which amounted to 16,591 short tons, valued at 71,384 dols., came from Georgia, Wisconsin, Michigan, Rhode Island, South Carolina, California, Nevada, and North Carolina. Of artificial graphite there was manufactured a total of 2,620,000 lb., valued at 178,670 dols., all of it made by the International Acheson Graphite Company, of Niagara Falls, New York.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

CEMENT INDUSTRY OF GERMANY.

Foreign Office Annual Series, No. 3237.

After several years of ruinous competition the efforts aiming at a general understanding in the cement industry seem to have good prospects of ultimate success. Conventions between several local associations have already been effected or are nearing completion. However, there are still important interests outside the local syndicates which stand in the way of a comprehensive and universal organisation. The local syndicates embrace Silesia, Pomerania, South Germany, and a group of 15 works in Rhenish-Westphalia. The Hanoverian works are contemplating the formation of an association. Negotiations towards an understanding between the Rhenish-Westphalian group, the South German syndicate, the Hanoverian works and a Belgian syndicate are being carried on at present. The so-called Middle-German Works (in Thuringia and elsewhere) are ready to co-operate in a general organisation; it is in Hanover and in the Lower Elbe region that the idea of a general syndicate meets with opposition from some of the large works, which maintain that a fruitful organisation of the whole industry must be preceded by the stoppage of the small works.

Below are given the imports and exports of cement of all kinds during the half-year, January to June :—

	1902.	1903.	1904.
	Tons.	Tons.	Tons.
Imports	26,588	25,950	28,090
Exports	211,603	374,381	282,592
Excess of exports ...	218,015	348,431	254,502

The decrease of the exports is principally due to reduced shipments to the United States of America.

X.—METALLURGY.

VICTORIA; MINERAL PRODUCTION OF —.

Bd. of Trade J., Oct. 6, 1904.

The annual report of the Secretary of Mines and Water Supply for Victoria contains statistics and reports on water supply, geological survey, and the inspection of mines, and dredging, and the progress of mining and boring operations, &c., in that State during the year 1903, from which the following particulars have been taken :—

Gold.—The yield for the year under review was 822,424 oz., as compared with 777,738 oz. for the previous year, thus showing the substantial increase of 44,686 oz. The value of the gold won during 1903 was 3,259,482*l.*, as compared with 3,062,028*l.* Dredging is making steady progress year by year, owing to the facility with which ground intended to be operated on by dredges can be thoroughly and inexpensively tested beforehand, enabling a near approximation of its value being arrived at before large sums of money are expended in machinery, &c., which might eventually not be required. The total quantity of material treated during 1903 by dredge mining and hydraulic sluicing by gravitation was 7,963,927 cubic yards as compared with 6,911,697 cubic yards for the previous year. The gold obtained showed an increase of 8,937 oz., being 42,066 oz., as compared with 33,109 oz. In all, 51 dredge-mining plants, comprising 15 bucket dredges, 23 pump hydraulic sluices, 10 jet elevators, and 3 rotary hydraulic plants, were in operation, as well as 14 hydraulic sluicing by gravitation plants, and at the end of the year 14 other plants were in course of construction.

Coal.—There was a great falling off in the year's output of coal, owing to the strike of miners, which lasted for practically the whole of the year. The amount obtained was 64,800 tons, or a little more than a quarter of that for the previous year, which was 225,164 tons. The total output

of coal in Victoria to the end of 1903 now stands at 2,237,257 tons, valued at the pit's mouth at 1,239,026*l.*

Metals and Minerals, other than Gold and Coal.—The output of tin ore was 33 tons. Silver to the extent of 28,800 oz. was extracted from gold at the mint, and 5 tons of antimony ore were obtained at Heathcote for testing purposes, and 3,590 tons of gypsum from the Mallee, principally in the neighbourhood of Boort.

PIG-IRON PRODUCTION OF GERMANY.

Foreign Office Annual Series, No. 3287.

While the production of pig iron in the first half of 1903 showed an increase of upwards of 20 per cent. over the corresponding period of the previous year, in the period under review the output of pig iron increased only by 64,800 tons, or 1·3 per cent. The subjoined table gives the amounts of pig iron, in thousands of tons, produced by the various processes during the first half of the years 1902—1904 :—

Articles.	1902.	1903.	1904.
Puddle iron	596·5	451	411·4
Spiegel iron		376·7	293·8
Bessemer iron	191	209·7	220·9
Thomas pig iron	2,438·1	3,013·4	3,174·4
Foundry pig iron	790·2	883·8	898·9
Total	4,013·8	4,934·6	4,999·4

MANGANESE ORE; OUTPUT OF RUSSIA —.

Glückauf; through Eng. and Mining J., Sept. 29, 1904.

The output of manganese ore in Russia during 1903 amounted to 25,266,150 poods, or 418,860 metric tons. This shows a further decline in the industry, due to the continuance of the depression which began in 1901. The output is but little more than half of the total recorded in 1900, and falls considerably short of the production for the previous year, which was 28,648,635 poods. As usual, the Caucasus district contributed most of the supply, its output amounting to 22,974,603 poods. There were 251 mines under exploitation in this district, and the total number of employees was 2,004, as compared with 3,702 in 1902.

OPEN-HEARTH STEEL PRODUCTION OF THE UNITED STATES.

Eng. and Mining J., Sept. 29, 1904.

The total production of open-hearth steel ingots and castings in the United States in 1903, was 5,337,789 gross tons, against 5,687,729 tons in 1902 (an increase of 2·6 per cent.), and 2,230,292 tons in 1898.

In 1902, 4,496,538 tons of open-hearth steel were made by the basic process, and 1,191,196 tons were made by the acid process, while in 1903 the production by the basic process amounted to 4,741,913 tons, and by the acid process to 1,095,876 tons.

There was a decrease in the production of acid steel in 1903, as compared with 1902, of 95,320 tons, or a little over 8 per cent., but an increase in the production of basic steel of 245,380 tons, or almost 5·5 per cent.

CHINA; MINING IN —.

Foreign Office Annual Series, No. 3280.

Antimony continues to be mined in considerable quantities at Hunan : the production of metal in 1903 was 3435 tons, and of ore, 3234 tons (in 1902 the figures were 6740 tons and 3624 tons respectively). Japan took 1095 tons, and a large proportion was shipped to the United States. An installation, under German management, has been put up at Wuch'ang, to concentrate lead and zinc ores, capable of working 75 tons of ore daily. The iron mines at Ta-yeh shipped 50,000 tons of ore (2,000 tons more than in 1902) to Japan, and, as the ironworks at Hanyang increased their output of pig iron from 75 to 120 tons a day, they must have been supplied with 30,000 additional tons of ore and limestone. In return for a loan of 3,000,000 yen at 6 per cent., these mines have now been mortgaged to a Japanese

syndicate for a period of 30 years. A Japanese engineer is to be engaged, and the Imperial Iron Foundry undertakes to purchase 70,000 to 100,000 tons of ore annually at a price which, from now till August 1915, shall be at the rate of 3 gold yen per ton for first-class ore and 2 yen 20 sen for second-class.

At the end of 1902 the Provincial Government granted exclusive mining rights in the north-west of Fukien to certain Chinese and French concessionnaires, and a French mining engineer of high repute, who has been prospecting there during 1903, has obtained a careful survey of the gold-fields in the Shao-wu Prefecture. These are described as very valuable and worth working, and it is proposed to form a company with a capital of 1,250,000 dolrs. to commence operations.

XIV.—TANNING; LEATHER; GLUE, Etc.

LENTISK LEAVES IN TUNIS.

Foreign Office Annual Series, No. 3295.

The lentisk tree resembles a small shrub, grows wild, is very abundant in the whole Regency and produces a small, oval, thin, green leaf, which is gathered by the natives and brought to the market. Its prices in Tunis vary from 8 to 9 frs. per 100 kilos., or 80 to 90 frs. per metric ton. This includes the price of sacks in which the leaves are exported. The freight to the United Kingdom averages from 12s. to 15s. per ton. The lentisk leaves alone are not a powerful colouring agent, and this necessitates their mixture with sumac leaves, which are chiefly imported from Sicily. The lentisk leaves are said to contain about 10 to 12 per cent. of tannin, and the sumac from 40 per cent. upwards. British firms seem to prefer the leaves ground, so that most of the quantity intended for the United Kingdom is shipped to Italy and thence re-shipped in the ground state.

The exports of lentisk leaves were, during 1901, 3865 tons (value 7435*l.*); 1902, 4126 tons (value 7263*l.*); 1903, 7307 tons (value 16,421*l.*). The quantities coming to England are increasing, having been 251 tons in 1901, 364 tons in 1902, and 752 tons in 1903.

XVII.—BREWING, WINES, SPIRITS, Etc.

SPIRIT; IMPORTS AND CONSUMPTION OF FOREIGN AND COLONIAL — IN GREAT BRITAIN.

47th Report of Commissioners of Inland Revenue.

The following table gives the imports and consumption of foreign and colonial spirits in Great Britain during the last three financial years:—

Year.		Consumption.	Total Imports.
		Proof Galls.	Proof Galls.
1901-2	Not for methylating ...	10,536,909	12,418,037
	For methylating.....	627,410	
1902-3	Not for methylating ...	10,723,837	13,130,182
	For methylating.....	1,212,001	
1903-4	Not for methylating ...	8,416,120	9,959,804
	For methylating.....	334,140	

XVIII. B.—SANITATION.

GASEOUS POISONING: HOME OFFICE MEMORANDUM.

The following memorandum, "As to the Use of Water Gas and other Gases in Factories," was issued on Oct. 3 by the Chief Inspector of Factories:—

Carbonic Oxide Poisoning.—In recent years there has been great extension of the manufacture and use of water gas and other gases of a similar nature (Dowson gas, Mond gas, power gas, producer gas, blast furnace gas, &c.) for heating furnaces and boilers in factories, driving gas engines, welding, and many other industrial purposes. The particular danger associated with all these gases is that of poisoning by carbonic oxide (carbon monoxide, CO), which is also a constituent of ordinary coal gas. But whereas the proportion in coal gas varies from 4 to 12 per cent., in

carburetted water gas it reaches 30 per cent., and in uncarburetted water gas 50 per cent. The other gases named above usually contain from 10 to 25 per cent.

The use of these gases was the subject of an enquiry in 1899 by a Departmental Committee,* who recommended in their report that the manufacture and distribution for heating and lighting purposes of any poisonous gas which does not contain a distinct and pungent smell should be prohibited, and that regulations should be made limiting the proportion of carbonic oxide. In recent Acts authorising companies and local authorities to manufacture and supply Mond or similar gas for motive or heating purposes, it is required that (1) the quantity of carbonic oxide in the gas shall be limited to 14 per cent.; and (2) the gas shall be strongly scented. It is made the duty of H.M. Inspectors of Factories to enforce these provisions as regards factories and workshops to which the gas is distributed.

The annual reports of the Factory Department during the five years 1899 to 1903 contain references to at least 51 cases, including 17 deaths, of poisoning by carbonic oxide on manufacturing premises; 43 were due to one or other of the gases named above. These casualties were traced to several causes, among which may be mentioned:—(1) leakage from joints or taps in pipes or flues conveying gas; (2) gradual escape of the gas into a confined atmosphere, as into a small engine-room or the siphon-pit of the Dowson apparatus; (3) cleaning of tanks or flues before a sufficient time has been allowed for the gas to escape; (4) underground situation of flues; (5) inodorous nature of the gas; (6) ignorance of the danger from the gas and of the earliest symptoms produced by it; (7) working alone; (8) lack of rescue appliances; (9) incomplete combustion of gas in defective gas ironing machines.

Carbonic oxide poisoning may occur in other ways without inhalation of the particular gases named. Thus danger of this kind may arise in laundries from the use of gas irons, and in workrooms from defective gas fittings and from gas stoves, especially when no provision is made for the products of combustion to be carried away by a flue or chimney. The absence of a chimney in a room greatly increases the risk. Carbonic oxide is found also in lime kilns, cement works, and where braziers and coke fires are used in confined spaces.

Symptoms of carbonic oxide poisoning begin with throbbing of the blood vessels of the head, giddiness, palpitation of the heart, and weakness of the limbs. These become greatly aggravated after any exertion. Owing to their insidious onset and the cumulative effect of the gas, the weakness of the limbs may come on without attracting notice, so that the person affected is unable to make good his escape from the poisonous atmosphere.

Headache, anæmia, and defective nutrition may result from the long continued breathing of the gas in amount too small to produce immediate effects, such as might occur from defective gas fittings in work rooms.

The appropriate remedies for poisoning by carbonic oxide are—fresh air, artificial respiration, administration of oxygen, and the application of warmth.

Preventive measures.—The precautionary measures to be considered must vary somewhat according to the different manner in which the gas is manufactured and used in one and another factory, but the following are of general application:—

(1) Notices should be posted up stating the deadly nature of the gas, the symptoms produced by its inhalation, and the best means of rendering aid to those who are "gassed."

(2) Persons in charge of any engine worked by the gas, or of any apparatus in which it is stored, or otherwise exposed to risk of inhaling carbonic oxide, should be free from any disease of the heart or lungs. Employers would do well to cause such persons to be examined and certified by a medical man.

(3) No engine in which the gas is used should be in a confined space.

* Report of Water Gas Committee, 1899, on the Manufacture and Use of Gases containing a large proportion of Carbonic Oxide. C. 9164. Eyre and Spottiswoode. Price 1s. 2d., by post 1s. 5d.

(4) A competent and responsible person should, at stated short intervals, inspect all valves and connections, to see that there is no escape of gas; and a signed record with the dates of such inspections should be kept.

(5) The openings giving access to any part of the gas circuit should be few, and in positions as safe as possible, and opened only in cases of real need, and by responsible persons.

(6) No workman should enter, or approach when opened, the holder or other part of the gas circuit until the gas has been well flushed out by fresh air.

(7) A cylinder of compressed oxygen, fitted with a piece of rubber gas-tubing and a mouthpiece, should be kept in constant readiness. Such cylinders can be obtained fitted also with a reducing valve.

(8) Medical aid should be summoned immediately, but in view of the importance of losing no time in commencing treatment, the workmen employed should be instructed by a medical man in the manner of administering the oxygen and of performing artificial respiration. They should be especially warned of the danger of exposing the patient to cold.

Respirators are of no avail as a protection against carbonic oxide poisoning.

When, for purposes of rescue, it becomes necessary to enter an atmosphere charged with the gas, the rescuer must protect himself by tying a rope securely round his waist, the free end being held by persons outside; or, preferably, by the use of one or other of the special rescue appliances designed for such work. The principle underlying them is that the rescuer is made to breathe air, or a mixture of air and oxygen, which renders him independent of the poisonous atmosphere immediately surrounding him. Reference to such appliances, which are now kept in many chemical works, &c., will be found in the annual report of the Chief Inspector of Factories for the year 1895,* p. 47, and for the year 1896,† p. 31.

In towns where the public gas supply is largely charged with water-gas, attention to gas fittings in factories and workshops becomes a matter of increased moment.

The following notice, which has been drawn up by the Power Gas Corporation, Ltd., in consultation with the Medical Inspector of Factories, to be posted up near the place where danger arises, may serve as a model:—

Danger of Gassing.—Breathing of producer gas should be avoided. It is dangerous when breathed in quantity.

The first symptoms produced by breathing the gas are giddiness, weakness in the legs, and palpitation of the heart.

If a man feels these symptoms, he should at once move into fresh warm air, when, in slight cases, they will quickly disappear.

Exposure to cold should be avoided, as it aggravates the symptoms.

A man should not walk home too soon after recovery, as muscular exertion, when affected by the gas, is to be avoided.

If a man should be found insensible or seriously ill from the gas, he should at once be removed into fresh warm air, and immediate information be sent to the oxygen administrator, a medical man being sent for at the same time.

No man should work alone on any work which would be likely to involve exposure to the gas. Should the nature of the work cause the man to enter a culvert or hole, he should have a rope tied securely round his waist, held at the other end by his mate standing outside.

Use of the Oxygen Cylinder.—The cylinder should be provided with a lever key, nipple and union, together with a rubber tube at the end of which is a mouthpiece. It is also advisable to have a small pressure gauge attached to the cylinder, so that loss of oxygen may be observed and the cylinder kept in working order.

Open the valve gradually by tapping the lever key (fully extended) with the wrist until the oxygen flows in a gentle stream from the mouthpiece in the patient's mouth, and

allow the oxygen to be breathed until relief is obtained. The lips should not be closed round the mouthpiece, as it is important to allow free egress for surplus oxygen. The nostrils should be closed during inspiration or inflation of the lungs, and opened during expiration or deflation of the lungs, so that the oxygen may be inhaled as pure as possible through the mouth.

If the teeth are set, close the lips and one nostril. Let the conical end of the mouthpiece slightly enter the other nostril during inspiration and remove it for expiration.

Artificial Respiration.—Artificial respiration is sometimes necessary, in addition to the oxygen inhalation, if the oxygen does not appear to act quickly.

Place the patient on his back, slightly raising the shoulders with a folded coat; remove everything tight about the chest and neck; draw the tongue forward and maintain it in that position. Grasp the arms just above the elbows, and draw them steadily above the head, keeping them on the stretch for two seconds and then folding them and pressing them against the chest for the same length of time. Repeat these movements about 15 times a minute for at least half an hour, or until natural breathing has been initiated, when the oxygen inhalation alone will suffice.

After recovery, oxygen inhalation at intervals should be continued as desired.

Further detail may be needed in connection with particular branches of industry. Thus, in consequence of the constant danger of carbonic oxide poisoning in cement works, the Associated Portland Cement Manufacturers (1900), Ltd., have adopted the following notice, in addition to somewhat similar instructions to those given above:—

“Regular inspection of kilns must be made on opening after being burnt off, to see that they are safe for men to work in.

“Under normal conditions the kiln is partly and sometimes entirely drawn before the chamber is cool enough to enter to clear for re-loading, and inspection must cover safety, not only as to heat, but as to gases. The eye in front of kiln and back eye of chamber must be opened when drawing is commenced, and entrance to a chamber must be made cautiously. Should there be the slightest indication of gas, a paper torch must be thrown into the kiln and seen to burn out properly before work therein is commenced. If after several attempts it is clearly shown that a paper torch will not burn freely, the men must not be allowed to enter, and the matter must be at once reported to the manager. This applies more particularly where there is a kiln burning next to one that is being drawn, but in any case the dampers of the kiln being drawn must be down tight, and precautions taken generally to see that fumes from a burning kiln on the same flue cannot get back into a kiln in which men are at work; and this applies not only to the work of clearing or drawing, but to repair or any kind of work done in or about kilns.

“In case of a kiln which has lain cold for a long period, all the above-named precautions must be observed, and, in addition, before men enter the pan or chamber, the drawing eye of the kiln must be opened, and thoroughly freed below so that the air may pass into the charge. Employees are especially warned against adopting the means employed by many persons ignorant of the first principles of resuscitation, viz., placing men on their faces with mouth over a hole in the ground. All such means are strictly forbidden. The administration of stimulants in any form is most dangerous, and is also strictly forbidden.”

XX.—FINE CHEMICALS, Etc.

QUININE, ITALIAN.

Chem. and Druggist, Oct. 1, 1904.

The Italian Government are now making quinine dihydrochloride as well as hydrochloride, sulphate, and disulphate. The State sales of quinine amounted to 8,000 kilos. in 1903, with a net profit of 180,000 lire, against 3,000 kilos. in 1902.

* Annual Report of Chief Inspector of Factories, Part I. C. 8007. Price 5s. 1d., by post 5s. 3d.

† Annual Report of Chief Inspector of Factories, 1896. C. 8561. Price 5s. 1d., by post 5s. 3d.

Patent List.

N.B.—In these lists, [A.] means "Application for Patent," and [C.S.] "Complete Specification Accepted."

Where a Complete Specification accompanies an Application, an asterisk is affixed. The dates given are (i) in the case of Applications for Patents, the dates of application, and (ii) in the case of Complete Specifications Accepted, those of the Official Journals in which acceptances of the Complete Specifications are advertised.

Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, AND MACHINERY.

- [A.] 21,394. Stark. Method and apparatus for varying the temperature of fluids. Oct. 5.
 " 21,448. Newton. Filters. Oct. 6.
 " 21,458. Mitchell. Centrifugal apparatus for separating liquids from steam or other vapours or gases. Oct. 6.
 " 21,469. Walker. Drying machines. Oct. 6.
 " 21,644. Howatson and Boby. Filters. Oct. 8.
 " 21,775. Márton. *See under II.*
 " 21,945. Black. Means for and method of filtering liquids. Oct. 12.
 " 22,267. Szek. *See under II.*
 [C.S.] 24,931 (1903). Huillard. Apparatus for drying pasty and fluid substances. Oct. 12.
 " 26,575 (1903). Arnold. *See under XXII.*
 " 28,279 (1903). Samuelson and Hawdon. Blast furnaces. Oct. 19.
 2291 (1904). Pfeiffer. Method of and apparatus for evacuating air. Oct. 19.
 " 12,541 (1904). Montlaur. *See under XI.*

II.—FUEL, GAS, AND LIGHT.

- [A.] 21,317. Payens. Plants for making water-gas. [Ger. Appl., Oct. 6, 1903].* Oct. 4.
 " 21,318. Neuman. Combined double gas producers and steam generators for producing water-gas and producer gas, and generating steam by the heat of such gases. [Ger. Appl., Oct. 20, 1903].* Oct. 4.
 " 21,408. Perrier. Production of a combustible gas obtained by the combination of compressed air with petroleum. Oct. 5.
 " 21,494. Lion. Means for utilising naphthalene vapours for producing heat and motive power. [Fr. Appl., Oct. 7, 1903].* Oct. 6.
 " 21,538. Sahlin. Apparatus for cleaning blast furnace and like gases. Oct. 7.
 " 21,676. Carlan (Gen. Electric Co.). Electrodes specially applicable to electric arc lamps. Oct. 8.
 " 21,677. Carlan (Gen. Electric Co.). Electrodes specially applicable to electric arc lamps. Oct. 8.
 " 21,755. Márton. Manufacture of fuel and other briquettes. Oct. 10.
 " 21,790. Goode, Mitchell, and The Briquette Co., Ltd. Composition for briquetting. Oct. 10.
 " 22,002. Hennebutte. Manufacture of coke. Oct. 12.
 " 22,050. Ransford (Yacono). Treating smoke and apparatus therefor. Oct. 13.
 " 22,092. Robson. Gas producers.* Oct. 14.
 " 22,267. Szek. Manufacture of briquettes. Oct. 15.
 [C.S.] 21,316 (1903). Goode, Mitchell, and Oakley. Binding material for coal dust or other finely-divided substances. Oct. 12.
 " 23,771 (1903). Lymn. Gas-testing apparatus. Oct. 12.
 " 17,712 (1904). Nash. Gas producers. Oct. 12.

- [C.S.] 18,864 (1904). Verdier and Toulon. Gas retorts. Oct. 12.
 " 18,487 (1904). Junkers. Method of and apparatus for determining the heating value of gaseous and liquid fuels. Oct. 12.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM, AND MINERAL WAXES.

- [A.] 21,494. Lion. *See under II.*
 " 22,288. Koellner. *See under XII.*

IV.—COLOURING MATTERS AND DYESTUFFS.

- [A.] 21,638. Johnson (Badische Anilin und Soda Fabrik). Manufacture of azo colouring matters and intermediate products. Oct. 8.
 " 21,856. Cain. Manufacture of diazo compounds and of azo colouring matters therefrom. Oct. 11.
 [C.S.] 26,700 (1903). Naef and Levinstein. Manufacture of new sulphurised dyestuffs. Oct. 19.
 " 28,563 (1903). Newton (Bayer and Co.). Manufacture of new azo colouring matters and of colour lakes therefrom. Oct. 12.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

- [A.] 21,397. Cadgène. Dyeing materials in the piece.* Oct. 5.
 " 21,634. Könitzer. Production of oxidation black on animal fibres, mixtures of animal and vegetable fibres, and fabrics made from the same.* Oct. 8.
 " 21,793. Hofmann. Machines for printing yarn in several colours.* Oct. 10.
 " 21,822. Markus and The Barnwell Machine Co., Ltd. Machine for coating fabrics with finely comminuted materials. Oct. 11.
 " 21,934. Barnes. Warp sizing and drying machinery. Oct. 12.
 " 21,988. Imray (Meister, Lucius, und Brüning). Manufacture of silk-like threads and films. Oct. 12.
 " 22,093. Davies. Production of ornamental patterns or effects on velvets, velveteens, and other pile fabrics. Oct. 14.
 [C.S.] 20,959 (1903). Naeyer. Apparatus for dyeing, bleaching, degreasing, and mercerising textile materials. Oct. 12.
 " 21,595 (1903). Mather. Fabric printing machinery. Oct. 19.
 " 23,460 (1903). Donisthorpe, White, and Ellis. Dyeing of yarns and fabrics produced therefrom. Oct. 19.
 " 25,611 (1903). Donisthorpe and White. Production of parti-coloured yarns. Oct. 19.
 " 26,521 (1903). Wakefield. Bleaching of textile fabrics and fibres. Oct. 12.
 " 27,202 (1903). Velvrl Co., Ltd., and Howkins. Spreading machine for coating fabrics, &c. Oct. 19.
 " 13,478 (1904). Smith. Multiple-ply woven fabrics and process for treating the same. Oct. 19.

VII.—ACIDS, ALKALIS, AND SALTS.

- [A.] 21,387. Jaubert. Preparation of substances containing easily liberated oxygen. [Fr. Appl., Oct. 14, 1903].* Oct. 5.
 " 21,393. Souheur. Preparation of briquettes of arsenious acid. [Fr. Appl., Oct. 6, 1903].* Oct. 5.
 " 22,004. Johnson (Deutsche Gold und Silber-Scheide-Anstalt vorm. Rössler). Manufacture of sodium perborate. Oct. 12.

- [A.] 22,216. Hall and Anson. Separating oxygen from nitrogen. Oct. 15.
 " 22,228. Craig. Apparatus for manufacturing and extracting ozone from atmospheric air. Oct. 15.
 [C.S.] 19,196 (1903). Parker. Production of sodium and potassium. Oct. 12.
 " 21,382 (1903). Brookes (Chem. Werke Hansa). *See under XX.*
 " 21,392 (1903). Schulze. Manufacture of porous barium oxide. Oct. 12.
 " 25,972 (1903). Atkins, and Oxchlorides, Ltd. Means of preserving the strength and keeping powers of solutions of alkaline chlorides and oxchlorides. Oct. 19.
 " 26,996 (1903). Davis. Construction of ammonia stills. Oct. 19.
 " 6846 (1904). Lake (Soc. Anon. Ing. L. Vogel per la fabr. di concimi chimici). Manufacture of sulphuric acid. Oct. 19.

VIII.—GLASS, POTTERY, AND ENAMELS.

- [A.] 21,395. Stark. Ceramic products. Oct. 5.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

- [A.] 21,238. Reavell. Manufacture of artificial stone.* Oct. 4.
 " 22,023. Caddick and Oliver. Method of making building materials. Oct. 13.
 " 22,056. Castle. Manufacture of cement. Oct. 13.
 " 22,169. Perkin, and Whipp Bros. and Todd, Ltd. Treatment of wood for rendering it fireproof. Oct. 14.
 [C.S.] 21,316 (1903). Goode, Mitchell, and Oakley. *See under II.*
 " 21,578 (1903). Reichel. Method of preserving wood. Oct. 19.
 " 22,042 (1903). Weaver. Paving blocks made from towns' refuse. Oct. 19.
 " 15,142 (1904). Müller. Manufacture of bricks and products with a facing of carborundum. Oct. 12.
 " 15,176 (1904). Steenbock. Manufacture of vitreous cement. Oct. 19.

X.—METALLURGICAL.

- [A.] 21,238. Wild. Method for extracting precious metals from telluride and sulphotelluride ores, tailings, concentrates, and the like. Oct. 4.
 " 21,322. Strecker and Strecker. *See under XI.*
 " 21,566. Cowper-Coles, and The Metals Corporation, Ltd. *See under XI.*
 " 21,657. Cokayne (Zamora). Recovery of copper from its ores, and apparatus therefor. Oct. 8.
 " 21,661. Utehmänn. Means for protecting copper from destruction by sea water. [Ger. Appl., Oct. 10, 1903.]* Oct. 8.
 " 21,669. Quennell (Miller). Treatment of refractory ores. Oct. 8.
 " 21,766. Siemens und Halske Act.-Ges. Process for purifying tantalum metal. [Ger. Appl., Oct. 15, 1903.]* Oct. 10.
 " 21,768. Sayer and Spiers. Extraction and recovery of gold. Oct. 10.
 " 22,133. Atkinson. Treating ores. Oct. 14.
 " 22,195. Beyer. Hardening or tempering iron or steel. Oct. 15.
 [C.S.] 21,287 (1903). Dejeu. Process for engraving and etching metal. Oct. 12.
 " 26,391 (1903). Ogle, and Rapid Cyanide Treatment, Ltd. Extraction of metals from their ores. Oct. 19.

- [C.S.] 1767 (1904). Ganelin, and Accumulatoren Fabr., A.-G. Process for extracting metals, such as lead and silver, from ores. Oct. 19.
 " 16,896 (1904). Abel (Siemens und Halske A.-G.). *See under XI.*
 " 18,568 (1904). Herzog. Composition for uniting or soldering cast iron. Oct. 10.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

- [A.] 21,211. Kieseritsky. Regenerating negative accumulator plates of diminished capacity and avoiding the diminution in capacity of new plates. Oct. 3.
 " 21,310. Moseley. Smelting furnaces and electric stoves. Oct. 4.
 " 21,322. Strecker and Strecker. Etching metal plates by the aid of electrolysis.* Oct. 4.
 " 21,402. Jungner. Electrodes for accumulators with invariable electrolyte. [Appl. in Sweden, Oct. 7, 1903.]* Oct. 5.
 " 21,403. Jungner. Method of increasing the activity in electrode masses of badly conductive metallic oxides or hydrates in accumulators with invariable electrolyte. [Appl. in Sweden, Oct. 31, 1903.]* Oct. 5.
 " 21,553. Strickland. Galvanic dry cells. Oct. 7.
 " 21,562. Koopman (Townsend). Electrolytic method of producing white lead. Oct. 7.
 " 21,566. Cowper-Coles, and The Metals Corporation, Ltd. Electro-deposition of copper and other metals. Oct. 7.
 " 21,672. Lake (Soc. Anon. la Carbone). Electric batteries. Oct. 8.
 " 21,894. Gregory. Regenerative dry batteries.* Oct. 11.
 " 21,911. Narino. Electric batteries, electrolytic apparatus, &c. Oct. 11.
 " 21,913. Ziegenberg. Manufacture of galvanic cells.* Oct. 11.
 " 22,210. Stead. Dry voltaic cells. Oct. 15.
 [C.S.] 24,472 (1903). Ruhstrat and Grimmer. Electric furnaces. Oct. 12.
 " 8365 (1904). Fairweather (Vesta Storage Battery Co.). Storage batteries. Oct. 19.
 " 12,541 (1904). Montlaur. Production of chemical reactions in gases and vapours by electric discharges. Oct. 12.
 " 14,059 (1904). Potthoff. Apparatus for electro-galvanising. Oct. 12.
 " 16,896 (1904). Abel (Siemens und Halske Act.-Ges.). Method of producing zinc from sulphate solutions by electrolysis. Oct. 19.

XII.—FATTY OILS, FATS, WAXES, AND SOAP.

- [A.] 21,514. Seidler and Paul. Process for deodorising fish oils, train oils, and products of similar origin. Oct. 7.
 " 21,596. Bedford, Bedford, and Crowther. Process and apparatus for the preparation of soap. Oct. 8.
 " 22,238. Koellner. Apparatus for purifying oil and the like.* Oct. 15.
 [C.S.] 27,019 (1903). Powell. Manufacture of fancy soaps. Oct. 12.
 " 16,836 (1904). Riviere. Obtaining glycerine and other products from distillers' wash and other industrial liquids. Oct. 19.
 " 17,866 (1904). Lausen. Method of rendering plastic substances of fatty nature that are hard at ordinary temperatures. Oct. 19.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(A.)—PIGMENTS, PAINTS.

- [A.] 21,562. Koopman (Townsend). *See under XI.*
 [C.S.] 26,951 (1903). Rosenhain. Ink. Oct. 12.
 „ 28,563 (1903). Newton (Bayer and Co.). *See under IV.*

(B.)—RESINS, VARNISHES.

- [A.] 21,196. Kronstein. Process for treating varnishes, lacquers or the like to make them dry quickly. Oct. 9.

(C.)—INDIA-RUBBER.

- [A.] 21,234. Betty. *See under XIV.*
 „ 21,899. Frost. Vulcanising apparatus. Oct. 11.

XIV.—TANNING; LEATHER, GLUE, SIZE, Etc.

- [A.] 21,234. Betty. Leather and rubber waterproof and preserver. Oct. 4.
 „ 21,865. Hatmaker. *See under XVIII. A.*
 [C.S.] 18,691 (1904). Jerrett, Graham, and Blair. Leather-dressing composition. Oct. 12.

XV.—MANURES, Etc.

- [C.S.] 19,068 (1904). Jenkner, Jenkner, and Peyl. *See under XVIII. C.*

XVI.—SUGAR, STARCH, GUM, Etc.

- [A.] 21,636. Youles and Nightingale. Method of and apparatus for the production of caramel. Oct. 8.
 „ 21,865. Hatmaker. *See under XVIII. A.*

XVII.—BREWING, WINES, SPIRITS, Etc.

- [A.] 21,380. Friswell. The maturing of potable spirituous liquids. Oct. 5.
 „ 21,389. Hower. The process of brewing. Oct. 5.
 [C.S.] 28,630 (1903). Brackenbury. Malt kilns. Oct. 12.
 „ 16,836 (1904). Riviere. *See under XII.*

XVIII.—FOODS; SANITATION, WATER PURIFICATION; & DISINFECTANTS.

(A.)—FOODS.

- [A.] 21,549. Heritte. Preservation of organic substances. Oct. 7.
 „ 21,865. Hatmaker. Process of obtaining milk sugar and casein from milk. Oct. 11.
 „ 21,866. Hatmaker. Clotted milk, cheese, and cheese making. Oct. 11.
 „ 22,030. Posternak. Production of soluble earthy-alkaline and metallic salts of the organic phosphorus compound contained in vegetable food-stuffs.* Oct. 13.
 [C.S.] 12,113 (1904). Schröder. Sterilisation of food and other substances. Oct. 19.
 „ 18,441 (1904). Lake (Belmont). Manufacture of coffee substitutes. Oct. 12.

(B.)—SANITATION; WATER PURIFICATION.

- [A.] 22,215. Fiddian. Apparatus for use in distributing liquid sewage or sewage effluent on a filter bed. Oct. 15.
 „ 22,235. Wicks and Dodd. Distribution of sewage effluent or other liquids over bacteria or filter beds.* Oct. 15.
 [C.S.] 22,042 (1903). Weaver. *See under IX.*
 „ 23,837 (1903). Declercq. Apparatus for purifying water. Oct. 12.
 „ 24,838 (1904). Alliot and Scott-Moncrieff. Apparatus for distributing sewage and other liquid. Oct. 12.
 „ 25,490 (1903). Barwise. Filtering and purifying sewage. Oct. 19.

(C.)—DISINFECTANTS.

- [C.S.] 17,607 (1904). Endemann. Antiseptic preparations, and process for producing the same. Oct. 12.
 „ 19,068 (1904). Jenkner, Jenkner, and Peyl. Insect killer adapted for use as a manure. Oct. 19.

XIX.—PAPER, PASTEBOARD, Etc.

- [A.] 22,179. Perkins. Manufacture of paper for decorative purposes.* Oct. 14.
 „ 22,245. Didier. Manufacture and application of celluloid paste in imitation of horn, tortoiseshell, ivory, &c. [Fr. Appl., Nov. 3, 1903.]* Oct. 15.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

- [A.] 22,064. Meister, Lucius and Brünig. Manufacture of phenylmethyldichloropyrazole. [German Appl., Nov. 11, 1903.]* Oct. 13.
 „ 22,126. Merck. Preparation of pyrimidines. [German Appl., Jan. 28, 1904.]* Oct. 14.
 „ 22,127. Merck. Preparation of pyrimidines. [German Appl., Jan. 28, 1904.]* Oct. 14.
 „ 22,128. Merck. Preparation of pyrimidines. [German Appl., Nov. 14, 1903.]* Oct. 14.
 „ 22,129. Merck. Preparation of pyrimidines. [German Appl., Nov. 12, 1903.]* Oct. 14.
 [C.S.] 21,382 (1903). Brookes (Chem. Werke Hansa). Manufacture of soluble compounds containing iron and arsenic. Oct. 12.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

- [A.] 21,208. Brasseur. Carbon transfer paper. Oct. 3.
 „ 21,210. Brasseur. Polychrome photographs. Oct. 3.
 [C.S.] 18,183 (1904). Gaedicke. Production of silver emulsions for use in photography. Oct. 12.
 „ 18,890 (1904). Garainow - Trauttenberg and Fabian. Production of photographic paper and the like. Oct. 12.

XXII.—EXPLOSIVES, MATCHES, Etc.

- [A.] 21,204. Soc. de la Poudre Peigné et des Brevets J. Luciani. Manufacture of gunpowder. [Fr. Appl., Feb. 17, 1904.]* Oct. 3.
 [C.S.] 26,575 (1903). Arnold. Apparatus for weighing substances such as nitroglycerine. Oct. 12.

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Frank Clowes, D.Sc.	1897—1898.
George Beilby	1898—1899.
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Notices.

ST. LOUIS EXHIBITION AWARDS.

The following is a list of the awards at the St. Louis International Exhibition in Applied Chemistry, Electro-Chemistry, Metallurgy, and kindred industries. These effectively demonstrate the success of this country's participation in the enterprise, and are a proof of the general excellence of the British Exhibits.

The total number of Grand Prizes gained by Great Britain is 121, while 238 Gold Medals, 162 Silver Medals, and 132 Bronze Medals have been awarded to British Exhibitors, making 653 awards in all.

Group 20.—Medicine and Surgery.—Grand Prize: Wellcome Physiological Research Laboratories; Burroughs, Wellcome, and Co. **Bronze Medal:** Joseph W. Lovibond; John J. Griffin and Sons (Limited). **Awards to Collaborators.—Gold Medal:** Dr. Walter Dowson (Wellcome Physiological Research Laboratories). **Silver Medal:** A. G. Vernon Harcourt (John J. Griffin and Sons (Limited)).

Group 23.—Chemical and Pharmaceutical Arts.—Grand Prize: Low Temperature Research Exhibit of the British Royal Commission; British Cyanides Company (Limited); Burroughs, Wellcome, and Co.; Edward Cook and Co. (Limited); Doulton and Co. (Limited); Joseph Crosfield and Sons (Limited); J. C. and J. Field (Limited); Evans, Sons, Lescher, and Webb (Limited); Gas Light and Coke Company; Hopkin and Williams (Limited), and Howards and Sons (Limited); Levinstein (Limited); Nobel's Explosives Company (Limited), and The Birmingham Metal and Munitions Company; Price's Patent Candle Company (Limited); Professor Sir William Ramsay, K.C.B., D.Sc., LL.D., F.R.S.; United Alkali Company (Limited); Peter Spence and Sons (Limited). **Gold Medal:** Allen and Hanburys (Limited); Stafford Allen and Sons (Limited); Anglo-Sicilian Sulphur Company (Limited); Baird and Tatlock (Limited) (London); Brooke, Simpson, and Spiller (Limited); Brunner, Mond, and Co. (Limited); Burmah Oil Company (Limited); the Cassel Gold Extracting Company (Limited); The Castner-Kellner Alkali Company (Limited); Chance and Hunt (Limited); Spencer Chapman and Messel (Limited); Corbyn, Stacey, and Co. (Limited); John J. Griffin and Sons (Limited); Hemingway and Co., and Hemingway's London Purple Company (Limited); McDougall Brothers; May and Baker (Limited); Dr. Ludwig Mond, F.R.S.; T. Morson and Son; The Owens College; James Pain and Sons; Royal College of Science, London; South Metropolitan Gas Company; Towson and Mercer; Thomas Tyrer and Co. (Limited); John and James White; Wood and Bedford. **Silver Medal:** Assam Oil Company (Limited); Lewis Berger and Sons (Limited); A. Boake, Roberts, and Co. (Limited); Walter Carson and Sons; J. M. Collett and Co.; R. and J. Garraway; The Glasgow and West of Scotland Technical College; Professor W. N. Hartley, D.Sc., F.R.S.; F. Kendall and Son (Limited); John Bennet Lawes and Co. (Limited); Joseph W. Lovibond; Dr. Allan Macfadyen; William Martindale; the Mond Nickel Company (Limited); Morris, Little, and Son (Limited); B. E. R. Newlands, F.I.C., F.C.S.; Newton, Chambers, and Co. (Limited); Parkin, Ness, and Co.; W. Pearce and Sons (Limited); Sharon Chemical Company (Limited); Sheppey Glue and Chemical Works (Limited); J. W. Swan, D.Sc., F.R.S., and J. A. Kendall; William Warren (Hooper and Co.). **Bronze Medal:** J. B. Aitken; P. and J. Arnold; John Austen; E. C. C. Baly; Battley and Watts; F. W. Berk and Co. (Limited); The Bone Phosphate and Chemical Company (Limited); Corebros (1903) (Limited); George Clark and Son (Limited); Cornwall Arsenic Company; H. C. Fairlie and Co.; Daniel Davison; The Grove Chemical Company (Limited); W. H. Francis; W. J. Fraser and Co.; F. C. Hills and Co.; Kemball, Bishop, and Co. (Limited); The Society of Apothecaries of London; Stone and Tinson; John and E. Sturge; Alfred White and Sons. **Awards to Collaborators.—Gold Medal:** Professor Sir James Dewar, M.A., LL.D., D.Sc., F.R.S. (Low

Temperature Research Exhibit); T. Wilton (the Gas Light and Coke Company); Dr. Andrew Ross Garrick (the United Alkali Company, Limited). **Silver Medal:** J. E. Petavel (Low Temperature Research Exhibit); Dr. Rudolf Messel (Spencer Chapman and Messel, Limited); Julius Lewkowitsch, Ph.D. **Bronze Medal:** Dr. Carl Langer (the Mond Nickel Company, Limited); C. T. Tyrer (Thomas Tyrer and Co., Limited); Hugh Ramage (Professor W. N. Hartley).

Group 52.—Plant and Processes for Finishing Textiles.—Gold Medal: Daniel Lee and Co.; William Liddell and Co. (Limited); John S. Brown and Sons.

Group 68.—Electro-Chemistry.—Gold Medal: United Alkali Company (Limited). **Silver Medal:** Sherard Cowper-Coles and Co. (Limited). **Awards to Collaborators.—Silver Medal:** Dr. Andrew Ross Garrick (United Alkali Company, Limited).

Group 80.—Fertilisers.—Gold Medal: The Aberdeen Comb Works Company (Limited); Sheppey Glue and Chemical Works (Limited). **Silver Medal:** The Grove Chemical Company (Limited).

Group 86.—Equipment and Methods for Preparing Foods.—Grand Prize: Joseph Baker and Sons (Limited). **Gold Medal:** A. Boake, Roberts, and Co. (Limited). F. Kendall and Son (Limited).

Group 87.—Farinaceous Products and their Derivatives.—Gold Medal: Burroughs, Wellcome, and Co. **Bronze Medal:** Joseph Edmunds.

Group 90.—Sugar and Confectionery.—Grand Prize: J. A. Sharwood and Co. (Limited); A. Boake, Roberts, and Co. (Limited); Joseph Edmunds. **Gold Medal:** H. P. Setna and Co.; Evans Sons, Lescher, and Webb (Limited); F. Kendall and Son (Limited).

Group 95.—Inedible Agricultural Products.—Grand Prize: The Wellcome Chemical Research Laboratories. **Gold Medal:** A. S. Mackertich and Co.

Group 96.—Insects and their Products.—Gold Medal: McDougall Brothers.

Group 114.—Appliances for Gathering Wild Crops.—Gold Medal: The Wellcome Chemical Research Laboratories.

Group 118.—Metallurgy.—Grand Prize: Birmingham Metal and Munitions Company. **Gold Medal:** Sherard Cowper-Coles and Co. (Limited); the Lilleshall Company (Limited); the Monk Bridge Iron and Steel Company (Limited); the Farnley Iron Company (Limited). **Silver Medal:** The Anglo-French Nickel Company (Limited); Sheepbridge Coal and Iron Company (Limited); United Alkali Company (Limited). **Bronze Medal:** Joseph W. Lovibond.

THE JOURNAL.

From the beginning of next year the Society's Journal will be printed and published by Messrs. Vacher and Sons, Great Smith Street, Westminster, S.W., to whom all communications regarding subscribers' copies and advertisements should be sent.

SUBSCRIPTIONS FOR 1905.

Foreign and Colonial Members are reminded that the subscription of 25s. for 1905, payable on January 1st next, should be sent in good time to the Hon. Treasurer (Mr. Samuel Hall), in order to ensure continuity in the receipt of the Society's Journal. Any changes of address to appear in the new List of Members now in course of preparation should reach the General Secretary not later than January 15th, 1905.

ANNUAL GENERAL MEETING, NEW YORK. PHOTOGRAPHS.

The Columbia University Groups may be obtained from Mr. Harry Coutant, 5, West 31st Street, New York, and 18, Alice Court, Brooklyn, N.Y.

The Mount Vernon Groups may be obtained from Mr. G. Prince, Pennsylvania Avenue and 11th Street, Washington, D.C.

The Boston Groups may be obtained from Mr. E. Chickering, 21, West Street, Boston, Mass.

The prices vary according to size and form of reproduction, but those exhibited cost from 3 dols. to 4 dols. apiece. Remittances must accompany orders.

The Secretary is awaiting the receipt of particulars of other photographs taken from time to time.

RARE MINERALS FOR RESEARCH.

Mr. A. B. Frenzel, of 1540, Sherman Avenue, Denver, Colo., U.S.A., Commissioner of Rare Minerals for Colorado at the St. Louis Exposition, and a member of this Society, will give to any member of the Society, for research work, or for demonstrating purposes in any institution of learning, any reasonable quantities of ores containing uranium, vanadium, tungsten, or molybdenum, free on board, Denver, Colorado. Members should communicate direct with Mr. Frenzel.

COMMUNICATIONS.

Authors of communications read before the Society, or any of its Local Sections, are requested to take notice that under Rule 43 of the Bye-laws the Society has the right of priority of publication for three months of all such papers. Infringement of this Bye-law renders papers liable to be rejected by the Publication Committee, or ordered to be abstracted for the Journal, in which case no reprints can be furnished to the author.

Changes of Address.

When notifying new addresses, members are requested to write them distinctly, and state whether they are temporary or permanent. Multiplication of addresses is also to be avoided as tending to create confusion. When sending subscriptions, the use of the form attached to the application helps in the verification of addresses, on which the safe delivery of the Journal depends.

- Anfilogoff, Nicholas A., 1/o Thames Haven; 17, Windsor Road, Leyton, Essex.
- Bell, Hugh P., 1/o Egerton Crescent; 3, Mincing Lane, London, E.C.
- Bloxam, W. Popplewell, 1/o Bourne-mouth; 25, Upper Bedford Place, London, W.C.
- Bowey, John, jun., 1/o Coraopolis, Pa.; 567, Dufferin Avenue, London, Ont., Canada.
- Byrnes, Dr. Eugene A.; Journals to c/o Byrnes and Townsend, 918, F. Street N.W., Washington, D.C., U.S.A., Patent Lawyer.
- Cayvan, L. L., 1/o New York City; 4647, Indiana Avenue, Chicago, Ill., U.S.A.
- Clark, Edmund, 1/o Board of Health; Room 1007, Appraisers' Stores, 641, Washington Street, New York City, U.S.A.
- Clarke, Wm. B.; Journals to c/o Edison Swan U.E.L. Co., Ltd., Ponders End, Middlesex.
- Danziger, J. L., 1/o Niagara Falls; 302, West 114th Street, New York City, U.S.A.
- Enequist, John, 1/o Greene Avenue; 267, Rutland Road, Brooklyn, N.Y., U.S.A.
- Goodechild, Wm.; Journals to Bannie Mine, Sambas, Dutch West Borneo.
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- Haynes, D. O., 1/o Spruce Street; 90, William Street, New York City, U.S.A.
- Houlder, B. E., 1/o Portland Road; 50, Lady Margaret Road, Southall, Middlesex.
- Korte, Dr. B. F., 1/o Köln; 146, Alexandra Road, London, N.W., and (Journals) University College, London, W.C.

Laurence, Jas.; communications to P.O. Box, Joplin, Mo., U.S.A.

Remington, J. Percy; all communications to 86, Doughty Street, Brooklyn, N.Y., U.S.A.

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Warnes, A. R., 1/o Calcutta; c/o T. W. Willson, 117, Boyson Road, Camberwell Gate, S.E.

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Young, Dr. Geo., 1/o Sheffield; Lauraville, Bladda, Port Erin, Isle of Man.

Death.

Ekman, C. D., at 23, Pier Road, Gravesend, Kent. Nov. 3.

CHANGES OF STYLE.

His Majesty the King has been pleased to confer the honour of a Baronetcy of the United Kingdom on Michael B. Nairn, Esq., and the honour of Knighthood on Dr. Joseph Wilson Swan, F.R.S.

Annual General Meeting,

NEW YORK, 1904.

PHILADELPHIA, MONDAY, SEPT. 12TH.

RECEPTION COMMITTEE.

Wm. Weightman, Hon. Chairman.

Samuel P. Sadtler, Chairman.

Theo. Armstrong.
H. R. Baltz.
Daniel Baugh.
Edward T. Beale.
Wm. H. Bower.
Chas. Heber Clark.
Walton Clark.
Pierre S. Du Pont.
Howard B. French.
Thos. S. Harrison.
Jas. F. Hope.
Harry W. Jayne.

H. P. Keller.
M. N. Kline.
John B. Lennig.
Robt. W. Lesley.
J. Merritt Matthews.
R. V. Mattison.
Geo. McNeely.
Geo. D. Rosengarten.
Pedro G. Salom.
E. P. Smith.
D. K. Tuttle.
Joseph Wharton.

On reaching Philadelphia at 10.10 a.m. the party was met by a deputation of the committee, accompanied by several ladies, among whom may be mentioned Mrs. Matthews, Mrs. Clark, Miss Sadtler, and Mrs. Rosengarten, and driven to Independence Hall, where they were received by Mr. J. Weaver, the first English-born mayor of Philadelphia, in the famous room where the Declaration of Independence was signed. They were then driven to the University of Pennsylvania, and, after an inspection of the laboratories, &c., were entertained at luncheon by the University authorities in the Howard Houston Hall. This hall is a club-house for the use of the students of the University, and provides a place where all may meet on common ground and have every facility for passing their leisure hours in healthy recreation. The equipment of the hall includes a reading room, furnished with periodicals and newspapers, smoking rooms, billiard and pool tables, bowling alleys, a bath room and a swimming pool, athletic trophy rooms, a large auditorium with grand organ, rooms for the University papers, dark room for photographers, and many others.

The University of Pennsylvania, founded in 1740 by the efforts of Benjamin Franklin, has to-day 2700 students, with 275 professors and instructors.

Visits were then paid to the Baldwin Locomotive Works, the Petroleum Refinery, the Varnish Works, and the United States Mint. The New Mint at Philadelphia is the finest building ever constructed for coining purposes. In the numismatic room are gathered for public inspection a valuable collection of the world's representative coins. From the corridors surrounding this department may be seen, from on high, through large plate-glass windows, the workrooms with the work of minting going on. First comes the room where the bullion is received, weighed, and deposited; next, the room of the refiner, where the pure metal is separated out; then the room where the metal is melted, alloyed, and cast into ingots; next, the room of the assayer; then, the room where the metal which has stood the test is rolled into long ribbons, from which the blanks or planchets are stamped; next, the room where the blanks are weighed and adjusted, and where those found to be of legal weight are raised round the edge and cleaned; then, the room where the blanks are stamped into coin; and, finally, the rooms where the coins are weighed counted, and packed into bags.

The party then drove through Fairmount Park, passing by the magnificent Washington statue and the site of the great exhibition, some of the pavilions of which still serve as boat clubs on the bank of the Schuylkill. Thence up the Wissahickon Drive and past the celebrated Fish House. The piece of marsh land on which the Fish House stands, some two acres in extent, is known as the "State in Schuylkill," and possesses a governor and legislature.

Dr. Samuel P. Sadtler, at a banquet—or second annual dinner—given at the Germantown Cricket Club, said, in proposing the health of the President, that Philadelphia chemists, whether manufacturers or professional men, felt a peculiar pleasure in welcoming their fellow members of the Society. They were glad to have that opportunity of showing that they appreciated the importance of the object for which their Society was founded, *viz.*, the exchange of information and views on the application of chemistry to the manufacturing arts by means of sectional meetings and the publication of a journal. They were also delighted to meet face to face the distinguished representatives of chemical science who had honoured them with their presence.

The Society was not one with which Philadelphia had but a recent acquaintance. In the first year of its existence, already, it enrolled several Philadelphians among its members, and when he himself joined it, early in 1884, there were already eight other Philadelphians on the register. Now there were in the city and its suburbs about 60 members of the Society. It was true that they were enrolled each year in the published list of members of the New York Section, but that was only an illustration of the methods of "benevolent assimilation" on the part of their friends in the borough of Manhattan, to which they had become quite accustomed, and did not resent in the least. On the contrary, they had availed themselves of this membership to attend the New York meetings, and the Chemists' Club had always given them a royal welcome.

Turning to the chemical industries of the city, Dr. Sadtler said that the exigencies of the War of the Revolution led to the erection, in 1770, of large saltpetre works in Market Street. The firm of Christopher and Charles Marshall, sons and successors of Charles Marshall, an early druggist and so-called "fighting Quaker of Philadelphia," in 1786 manufactured extensively "muriate of ammonia" and "Glauber's salt." The manufacture of white lead was commenced by Samuel Wetherill, another druggist, about 1789, and rapidly developed. This business is still continued by the Wetherills. John Harrison, a druggist, about 1793, was the first to produce sulphuric acid on a commercial scale, and may be called a leader in the establishment of chemical industries in America. The firm of Farr and Kunzi engaged in the manufacture of sulphuric acid about 1812 and general chemicals in 1818. In 1838 the firm became Farr, Powers, and Weightman, and in 1841 Powers and Weightman. George D. Rosengarten began the manufacture of chemicals under the name of

Rosengarten and Zeither in 1822, and the name "Rosengarten and Sons" still continued with one of the sons and several grandsons of the founder still in control. Charles Lennig founded another important firm of chemical manufacturers about 1831. There were twenty-four works within the city engaged in chemical industry, while fifteen were engaged in the preparation of drugs.

In conclusion, Dr. Sadtler stated that Philadelphia was the leading city of the United States for the production of carpets and rugs, woollen goods, hosiery and knit goods, leather, chemicals, and dyeing and finishing textiles. It produced one-eighth of the chemical output of the country. He regretted that the shortness of the Society's stay in Philadelphia would not allow of their visiting many of the industrial establishments of the city. They would, however, receive a warm welcome at a future time when possibly they might have more leisure.

The party then left the club to rejoin the train for Washington.

WASHINGTON, TUESDAY, SEPT. 13TH.

RECEPTION COMMITTEE.

H. W. Wiley, Chairman.

Eugene A. Byrnes.	W. H. Helleman.
T. M. Chatard.	Lyman F. Kebler.
David T. Day.	Jas. B. Littlewood.
Fred. P. Dewey.	Chas. E. Munroe.
A. W. Dow.	R. Outwater.
Edwin C. Eckel.	Harry J. Patterson.
Wm. S. Ferris.	E. Richards.
Max Georgii.	Henry N. Stokes.
John J. Griffin.	Samuel S. Voorhees.

Marcus Benjamin, Secretary.

The Committee is subdivided as follows:—

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H. W. Wiley, Chairman.

Marcus Benjamin.	Samuel S. Voorhees.
Chas. E. Munroe.	

Finance Committee, Washington.

Chas. E. Munroe, Chairman.

T. M. Chatard.	A. W. Dow.
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Finance Committee, Baltimore.

H. Burroughs, jun.	Chas. Glaser.
A. E. L. Dohme.	

Entertainment Committee, Washington.

Samuel S. Voorhees, Chairman.

Fred. P. Dewey.	Eugene A. Byrnes.
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Entertainment Committee, Baltimore.

V. G. Bloede.

Press Committee.

Marcus Benjamin.

Ladies' Committee.

Mrs. Chas. E. Munroe.	Mrs. T. M. Chatard.
Mrs. Marcus Benjamin.	Mrs. A. W. Dow.
Mrs. V. G. Bloede.	Mrs. Samuel S. Voorhees.

Assisted by the wives of other members of the local committee.

On reaching Washington, the visiting members and ladies were met at the station by a committee of Washington members led by Dr. H. W. Wiley, and, after breakfast, proceeded to "see Washington" on electric cars, a guide on each describing the points of interest. Then they proceeded to Heurich's Brewery, where they were entertained at luncheon. Mr. Christian Heurich led the members through the large building and explained the working of the plant, which is an unusually fine one.

The members were then taken to "Cabin John's Bridge," seven miles from Georgetown, which forms part of the aqueduct system, and carries two 7-ft. pipes. The bridge is 420 ft. in length, and the arch, with a span of 230 ft., was long reputed to be the largest stone arch in existence.

In the evening there was a reception and supper at "Rauscher's," where three couples of negroes, led by a master of the ceremonies, all amateurs, performed a cakewalk.

WEDNESDAY, SEPT. 14TH.

Wednesday morning was spent in visiting the public buildings. At the Capitol were shown the Senate House and House of Representatives. These occupy wings right and left of the old Senate House, now the Supreme Court Room, and the old House of Representatives, now the National Statuary Hall. The Library of Congress, which may fairly be called the National Library, and contains about a million and a quarter of books, was shown by Dr. Herbert Putnam, the Chief Librarian, assisted by Mr. Bernard Green, C.E., superintendent of buildings and inventor of the bookstands and automatic transporting machinery used in the Library, Mr. Hutchinson, who is in charge of the Reading Room, and fourteen other guides specially detailed by the Chief for this purpose.

The White House, the Smithsonian Institution, the Navy Yard, and the Washington Monument were also visited, and on each occasion there was the same personal courtesy and guidance from the chiefs of Departments, while many things not ordinarily shown were freely placed before the members.

The Navy Yard, with its gun shops, where great lathes perform the turning, boring, and rifling of the steel breech-loading guns of the U.S. Navy, some of which weigh more than sixty tons, and its historic relics and trophies of former wars, was found to be of great interest to many.

The three publications of the Smithsonian Institute, "Contributions to Knowledge," "Miscellaneous Collections" and "Annual Reports" are known wherever science flourishes. Its famous Hodgkins medal and prize of 2000*l.* were bestowed in 1895 on Lord Rayleigh and Sir William Ramsay for their discovery of Argon.

The National Museum, which is under the care of the Secretary of the Smithsonian Institution, occupies a building adjacent to the parent institution, and contains precious relics of famous citizens, notably those of Washington, Lincoln, and Grant. This museum is also particularly rich in specimens illustrating the customs, arts, and industries of the North American Indians and the aborigines of North-western America.

The Bureau of Engraving and Printing is a branch of the Treasury Department, and there were shown the printing of the Government bonds, and the national currency or "greenbacks," as well as the postage and revenue stamps, military, naval, and diplomatic commissions, passports, &c. In this building there are fourteen departments and 1400 employees; each piece of work passes through the hands of thirty different persons.

The Bureau of Chemistry attached to the United States Department of Agriculture is divided into ten sections, according to the nature of the question to be investigated. The *Division of Foods* (chief, W. D. Bigelow) is charged with the inspection and examination of imported foodstuffs, and also the effect of preservatives on nutrition. In addition to these, the analytical methods necessary for the examination of food are studied. The *Division of Tests* (chief, L. W. Page) has for its object the testing of road materials, clays, cements, and concretes. The *Sugar Laboratory*, which is under the personal supervision of Dr. H. W. Wiley, chief of the bureau, is largely occupied with the study of sugar-beets grown in collaboration with the agricultural experiment stations under various conditions. The laboratory is also engaged in controlling the polarisation of imported sugars for dutiable purposes. In the *Dairy Laboratory* samples of dairy produce of every description are analysed. The *Insecticide and Agricultural Water Laboratory* studies the composition and effect of the various insecticides on the market, and examines the irrigation waters of the west and south-west; an examination of the leading mineral waters of the United States is also in progress. The examination of all kinds of medicinal remedies and crude drugs is undertaken in the *Drug Laboratory*, with especial reference to the analytical

methods employed for such work. The *Contracts Laboratory* was organised for the purpose of examining all kinds of materials to be purchased by the United States Department of Agriculture. Fertilisers and their effects, and also the constitution of plants are investigated in the *Plant Laboratory*. The *Microchemical Laboratory* is charged with the microscopical and microchemical study of foods, drugs, cattle-food, paper and textiles, miscellaneous agricultural products, &c., especial attention being paid to the histological study of fruits, spices, cereals, starches, &c. Examinations are also made of the urine and blood in connection with the work on the effect of preservatives on nutrition. The *Leather and Paper Laboratory* conducts investigations on tannins, tanning materials, and leather production; also on papers, as regards their fitness for use in various Government departments, and on the raw materials used in paper manufacture. Among other work which has been taken up by the bureau may be mentioned a study on the influence of environment on the composition of certain agricultural products, and an investigation in oenological technology, with especial reference to alcoholic ferments and the composition of fruits and fruit juices and their fermented products.

In the afternoon a party, smaller than it would have been but for the inclemency of the weather, went by electric "trolley car" to visit Mount Vernon, the home of General Washington. This mansion overlooks the Potomac River, and is built of wood, cut and painted to resemble stone.

The visitors were shown the mansion, with its historic relics, by the Superintendent, Mr. Dodge, who explained in detail the significance of each object. With bowed and uncovered heads the visitors stood before the tomb of Washington, thus paying a silent tribute to the worth of this great man. They were much interested in the young tree planted by the British Ambassador by special order of his Majesty, King Edward, to take the place of the one planted by him when as Prince he visited the tomb of Washington in 1864. The tree planted by the young Prince unfortunately died. The domain is well cared for by the "Ladies' Mount Vernon Association."

The party then returned to Washington. In the evening, the visitors were entertained by Mr. and Mrs. V. G. Bloefe, of Baltimore, at a vaudeville performance at Chase's theatre. The return to the hotel and the subsequent ride to the railway station were achieved under difficulties, owing to the flooding of the city by a violent thunderstorm.

The Cosmos Club, the science club of Washington, extended courtesies to the gentlemen, while the Washington Club, through the kindness of the Ladies' Committee, extended its privileges to the ladies.

(To be continued.)

New York Section.

Meeting held at the Chemists' Club, on Friday,
October 21st, 1904.

MR. R. W. MOORE IN THE CHAIR.

CHAIRMAN'S ADDRESS.

CHEMISTRY IN CUSTOMS ADMINISTRATION.

BY RUSSELL W. MOORE.

The science of chemistry has so many ramifications in the industry of a country that many of the spheres in which its influence is felt receive occasional attention only. Thus at times the transportation of chemicals is discussed and valuable facts brought to light, showing that from want of knowledge of the character of various chemicals, many

incongruities in freight rates occur. Chemicals as a class are popularly considered dangerous, hence insurance rates are often unnecessarily and sometimes arbitrarily high. Better knowledge will bring about better conditions, but since these matters are but a detail of chemical industry, they will probably never receive any united attention from manufacturers and consumers, but will have to depend largely on occasional effort for improvement. I have chosen as my subject a phase of chemistry which, as far as I can learn, has, in America, never been the subject of either book or pamphlet, and of but one paper. The files of chemical literature are silent; only occasionally, almost lost to chemists in legal reports, are to be found reports of Customs cases in which much chemical evidence is contained, and in which the judicial decision was largely based on the chemical facts established. Nevertheless, chemistry has an important influence on the administration of the United States Customs laws, and without its aid many irregularities and injustices would arise which would seriously be felt by chemical manufacturers and dealers. A few figures will show the great volume of merchandise which is handled in the customs houses of the United States.

The imports amounted, at the close of the fiscal year ending June 30, 1904, to 991,090,978 dols., of which 45.82 per cent. were free of duty. The duties collected amounted to 262,018,079 dols. The value of chemicals, drugs, and dyes imported during the same period was 65,272,176 dols., while oils of all kinds and paints, pigments, and colours amounted to 12,853,461 dols. Of these imports, merchandise of the value of 25,696,934 dols., of which 12,268,535 dols. is dutiable, was again exported to other countries. Of this volume of imports, about 70 per cent. is handled at the port of New York, while other ports constantly refer samples of merchandise to New York for information regarding the proper rate of duty and value.

The part that chemistry plays is to furnish all possible chemical data and facts to arrive at a correct tariff classification and value, and to aid in the collection of the proper amount of duty. A coal-tar dyestuff may be taken as an instance. The tariff assesses no duty on dyestuffs derived from alizarin or anthracene, but places a duty of 30 per cent. on all other coal-tar colours. The reason for this is apparent. Anthracene is not extensively produced in the United States, nor are alizarin dyestuffs, while other coal-tar colours are produced in considerable quantity. New dyestuffs are constantly being introduced, and must be examined chemically to determine their constitution. Often the question is a very narrow one, as in the case of condensation products from anthracene and toluidine. Simpler instances are argols (where the duty is levied according to certain limits of potassium bitartrate), borate of lime (where the percentage of anhydrous boric acid is the basis of the rate of duty), and still wines, which pay 40 cents per gallon if containing 14 per cent. of alcohol, and 50 cents per gallon if more. The function of the chemist is obvious. Of great importance is the assessment of duty on imported raw sugar, which, beginning with a polariscopic test of 75°, levies a duty of 0.035 cent. on each additional degree. This test was applied to sugar valued at 71,409,639 dols. in the year ending June 30, 1904. It must be remembered that the tariff is not a scientific paper, though it makes use of scientific terms, and that tariff distinctions are not necessarily scientific distinctions. Often a very simple examination suffices to determine the tariff description of a chemical, while to thoroughly identify it would be a great labour.

One of the most important cases under the present law hinged on the meaning of the term "derived from alizarin" or "from anthracene" as applied to dyes. The chemical view would include all the numerous derivatives. The position of the Government was, that the word was used in the ordinary sense of obtained or made from alizarin, and such was the final decision of the court.

The variety of samples analysed calls, in the first place, for a number of chemists with differing specialties. This is further required for the reason that in Custom matters one individual must be responsible for the report. No divided responsibility or work is possible, since the report may be used as evidence in a Customs suit, in which case the

chemist may be called as a witness. Hence all chemists signing reports are on the same official basis; and a large Customs laboratory is in fact a collection of small laboratories, and not an organisation founded on the principle of division of labour. The most prominent requisite for Customs analyses is rapidity, combined, of course, with reasonable accuracy. Thus volumetric methods are followed whenever the amount of work renders them advantageous. The work bears the same relation to research analysis that journalism bears to literature. It must be clear, definite, and to the point. Problems do, however, arise in which not much aid can be derived from published methods, and research is necessary. Recently a case arose in which the quantitative analysis of a sample of a mixture of three fatty oils was required. These were identified as castor and olive oils and oleic acid. The chemist finally devised a method and reported a result, which the importer admitted was within 2 per cent. of his formula. I cannot refrain from saying that much difficult and laborious work is avoided by the readiness of the importers and manufacturers to furnish the Customs authorities with all necessary facts and data regarding their goods, so that a complicated research is often made a comparatively simple verification. While contests on the construction of the tariff are frequent, contests between Customs chemists and importers' chemists are almost unknown, as I am glad to say that both appear equally anxious to arrive at the truth.

Broadly speaking, a knowledge of chemical technology is of equal value to chemical knowledge in Customs matters; the origin, manufacture, and uses of various articles often determine their dutiable character quite as clearly as their chemical constitution. Here we are indebted to the Journal of the Society of Chemical Industry for a complete compendium of technical information, and all the more valuable for being recent.

When the importer is dissatisfied with the duty levied upon his goods, he can by protest or appeal obtain a new consideration of his case by the Board of General Appraisers. Here any chemical features that may arise are again carefully considered. Samples are again analysed if necessary, and any new chemical facts can be brought out. The Customs chemical report is subjected to scrutiny, and any error which may be detected duly allowed for. From this Board an appeal may be taken to the United States Courts, and frequently the United States district attorney avails himself of the services of the Customs chemist. It will be noted that at every step in this procedure the importer has ample opportunity to present both facts and arguments, and all chemical statements submitted are weighed and examined with care and skill.

Most of the Customs chemical work is performed in the laboratory attached to the office of the United States Appraiser at New York. The strictly chemical work is accomplished by two chemists occupied with metal ores and metallurgical products, one with merchandise containing alcohol, one with miscellaneous articles, including chemicals, fats, oils, paints, and drugs, one in estimating sugar in confectionery, preserved fruits, &c., and two with organic articles, together with a chemist in charge. During the last calendar year 38,751 samples of raw sugar were tested by the polariscope, and 7513 samples were chemically tested. In a note previously published in this Journal, April 30, 1900, I gave a rough classification of the samples received for analysis. The character, as well as the number of samples changes so much from year to year that a classification of this kind has only a temporary value. Nothing but actual experience will give a correct idea of the character of chemical work called for.

A similar rough classification of samples for the first six months of 1903 gives:—Asphalt, 4; chemicals, 174; Chinese wines, 62; coal-tar dyestuffs, 30; coal-tar preparations, 33; condensed milk, 17; confectionery, crackers, &c., 181; drugs, 14; dyewood extracts, 11; earths, stone, coal, and minerals, 52; fats, oils, waxes, and soap, 483; fertilisers, 21; fruit in sugar, 175; fruit in spirits, 28; fruit juice, 197; glycerin, 33; lead bullion and metallurgical products, 128; lead in cables, foil, and sheets, 106; metals and alloys, 193; medicinal preparations, 99; medicinal preparations, alcoholic, 131; miscellaneous, 278; paints and colours,

186; resins, 7; spirits, 27; vinegar, 167; wine, 346; wood-pulp, 332. Total, 3510.

It is not to be understood that samples from every importation of merchandise are tested chemically. The function of the Customs chemist is to supply the necessary knowledge to enable Customs officials to act correctly in cases of doubt or incomplete chemical evidence. The identity of a chemical once established, only occasional tests are required. I do not think that it is an over-statement to say that the Customs revenue is as much indebted to chemistry for the proper collection of duties on many articles as the manufacturer is indebted to his chemist for their production and quality.

While in no sense occupying a judicial position, the customs chemist is often called upon to furnish the facts which point irresistibly to a legal conclusion, and it is not saying too much to state that the chemical evidence in many cases requires to be as carefully weighed by the chemist as the legal evidence. Often judicial decisions are founded directly on the chemist's report. While this places a great responsibility on the chemist, it also furnishes him with a high ideal—to aid in administering the law of his country, not according to any policy, but with all the aid that a noble science can command in the interest of justice and right.

CONSTANTS OF COCOANUT OIL.

BY N. J. LANE.

	Method employed.		
	Hübl.	Hanus.	Wijs.
Iodine value found	8.08	7.68	7.94
Iodine value calculated on results from "cold ether" solution of lead soap.	7.11	7.00	7.85
Iodine value calculated on results from "hot ether" solution of lead soap.	7.76	7.94	7.83

Liquid Acids.

	Volumetric.		Gravimetric.			
	Per Cent.		Per Cent.			
Lead soap treated with cold ether	48.95		34.50			
" " " hot ether.	53.45		37.45			
	From Volumetric Determination of Liquid Acids.		From Gravimetric Determination of Liquid Acids.			
	Hübl.	Hanus.	Wijs.	Hübl.	Hanus.	Wijs.
Iodine value, cold ethereal solution of lead soap.	14.53	14.30	15.63	20.62	20.28	22.17
Iodine value, hot ethereal solution of lead soap.	14.50	15.10	14.04	20.68	21.16	19.52

In the "cold ether method" the lead soap was digested with cold ether, the solution diluted to 500 c.c. in a specially-made graduated tube, and an aliquot portion drawn off through a filter after the precipitate had settled. In the "hot ether method," the ethereal solution of the lead soaps was boiled before dilution.

Obituary.

HUGH SALVIN PATTINSON, Ph.D.

MEMBER OF THE SOCIETY OF CHEMICAL INDUSTRY, &C.

Hugh Salvin Pattinson, son of Mr. John Pattinson, public analyst for Newcastle-on-Tyne, received his early educational training at the Newcastle College of Physical Science, afterwards proceeding to Zürich, where, in 1877, he studied in the Polytechnikum, under Victor Meyer and G. Lunge, ultimately taking the Ph.D. degree. So enthusiastically did he enter into this course of study and research, that it is feared he overtaxed his strength, and thus, unfortunately, laid the foundation of much subsequent weakness and suffering. Returning to England about the year 1883, he worked for some time in his father's laboratory, afterwards becoming a partner with him. In this position he not only shared in the general work of the firm of J. and H. S. Pattinson, but also acted as joint public analyst with his father for the city of Newcastle and neighbouring towns. He was also, for some years, and so long as his other duties and health would allow, a most effective abstractor for the columns of this Journal. The following are amongst the more important of his scientific and analytical papers:—In conjunction with Dr. W. Michler, of Zürich, "*Zur Kenntniss der Diphenyl- und Ditolylverbindungen*," Ber., 1881, 14, 2161 b; and "*Ueber Tetramethylbenzidin*," Ber., 1884, 17, 115. Also, in conjunction with his father, "*Determination of Arsenic and Phosphorus in Iron Ores*," this J., 1893, 119; "*Preparation of Samples of Rich Argentiferous Lead for Assay*," this J., 1892, 321; "*Determination of Manganese in its Ores and Alloys*," this J., 1891, 333; "*Determination of Phosphorus in Iron*," this J., 1895, 443; and "*Determination of Tin*," this J., 1898, 214. Though enthusiasm in all that he undertook carried him far, yet his work was greatly hampered by his very delicate health, which necessitated at times prolonged periods of total rest and retirement. Amongst friends and more intimate associates alike, his constant cheerfulness in the face of terribly adverse conditions, was not only a continual source of wonder, but also of inspiration. After a few days' illness, he died at his home in Tynemouth on October 26, at the early age of 47.

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I.—PLANT, APPARATUS AND MACHINERY.

ENGLISH PATENTS.

Filtering Apparatus. R. Mechwart, Milan. Eng. Pat. 28,525, Dec. 28, 1903. Under Internat. Conv., Jan. 16, 1903.

THE filter—which is of the closed type with exchangeable filtering medium, and in which the filtering part is arranged without an outer chamber, and is almost directly impinged upon by the liquid to be filtered—has its filtering medium covered with a thin sheet of filtering paper, pressed close to the surface, in order to protect it from the jet or current of liquid to be filtered, which is under pressure.—W. H. C.

Filtering Apparatus. A. Forbes, Philadelphia. Eng. Pat. 17,772, Aug. 16, 1904.

A NUMBER of filtering chambers are arranged vertically around a standard which carries the supply and delivery pipes. Each filtering chamber consists of two hollow cones clamped together, carrying the filtering medium. Means for connecting and disconnecting the chambers with the supply and delivery pipes are provided.—W. H. C.

Drying Apparatus; New or Improved —. E. Tobler and Rheinische Webstuhl und Appreturmaschinenfabrik G. m. b. H., Dülken, Germany. Eng. Pat. 17,957, Aug. 18, 1904.

THE drying chambers, of which there are several, forming sectors of a vertical cylinder, are so arranged that the heated air passes through them successively. The order in which they receive the air current may be altered, either by rotating the body of the cylinder while the cover is fixed, or by rotating the cover and adjusting suitable slides, the general direction of the air current remaining unaltered.

—W. H. C.

UNITED STATES PATENTS.

Temperature; Means for Obtaining Liquid at a Desired —. M. Treves, Turin, Italy. U.S. Pat. 771,512, Oct. 4, 1904.

A PORTION of the liquid is heated and is then mixed with another portion which has not been heated. Means are provided for maintaining the pressure on the liquid, for adjusting the proportions in which the two portions are mixed, for regulating the heat, and for indicating the temperature of the mixture by means of a scale and pointer.

—W. H. C.

Condenser. F. J. Weiss, Basle, Switzerland. U.S. Pat. 771,515, Oct. 4, 1904.

MEANS are provided for exhausting the air of a vacuum condenser independently of the cold water supply which enters its upper part. A trough or series of troughs is arranged in the condenser to catch the water, which is conveyed by a pipe to a tank or series of tanks, and returned, by means of another pipe, to the condenser at a lower level. Thus the same water is used as spray several times.—W. H. C.

Crucible-Furnace and Crucible. G. L. Smith, Newport News, Va. U.S. Pat. 771,675, Oct. 4, 1904.

A CRUCIBLE having a bottom lateral discharge pipe, closed by a plug at the end next the crucible, is arranged in a furnace. The furnace has a spiral passage formed around the crucible, and a series of gas burners, disposed tangentially to the crucible. The air fed to the burners is preheated, by the waste heat, in a heater-box situated in the flue.—W. H. C.

FRENCH PATENTS.

Re-heating of Liquids; Process for the —. G. Tauer. Fr. Pat. 338,972, Aug. 7, 1903.

THE liquid to be heated is divided into two parts. One part flows into a vessel divided into two compartments by a plate, over which the liquid must flow to reach the other compartment, from whence it is drawn off through a pipe. The other part of the liquid passes through a heating jacket, and issues through perforations in a pipe lying along the bottom of the above vessel, where it mingles with the cold liquid flowing over the plate, heating it.—L. F. G.

Heating Liquids; Apparatus for —. G. Tauer. Fr. Pat. 338,973, Aug. 8, 1903.

THE apparatus is built up of a number of units, consisting of two end chambers connected by a bundle of jacketed tubes, through which the liquid to be heated flows. The various units are either inclined to the horizontal, or vertical, and are joined to each other in zig-zag fashion. Each unit is provided with separate blow-off and draw-off cocks, and each heating jacket is connected by a separate tube to the main heat supply.—L. F. G.

Water-Bath for Heating Liquids, or Liquids Mixed with Solids. P. P. A. Andrieu. Fr. Pat. 343,321, May 21, 1904.

THE apparatus serves either for heating grapes to a temperature of 55° C., and also for heating must or other sugared liquors, and for sterilising liquors containing vegetable or animal matter. It consists of a hollow cylinder jacketed by another cylinder, the space between being filled with hot water. Pipes traverse the inner cylinder, and the materials to be treated are passed through these, suitable inlet and outlet pipes being provided.—L. F. G.

Drying Apparatus for all Kinds of Materials. H. Diedrich. First Addition, dated June 2, 1904, to Fr. Pat. 342,417 of April 18, 1904.

THE material to be dried passes through a rotating hollow cylinder, and falls through holes situated at one end into another cylinder, concentric with the first. While traversing the cylinders the material is exposed to the action of a current of hot gases, part of which passes through the cylinders, and part around the exterior of the outside cylinder.—L. F. G.

Filtering Element. Filter- und Brautechn.-Maschinen-Fabr. Act.-Ges. vorm. L. A. Enzinger. Fr. Pat. 343,374, May 21, 1904.

EACH element consists of two cylindrical plates placed one inside the other, the plates being pierced by conical holes,

the bases of which are situated on the inner sides of the plates. The filtering material is pressed into the annular space between the two plates till of the consistency of cardboard. The liquid to be filtered is admitted into the inner cylinder, and the plates are suitably fixed at their upper and lower extremities.—L. F. G.

II.—FUEL, GAS, AND LIGHT.

ENGLISH PATENTS.

Coke Ovens. H. Koppers, Essen-on-the-Ruhr, Germany. Eng. Pat. 18,262, Aug. 23, 1904.

IN this coke oven the heating flues are constricted at the point where they pass into the upper horizontal passage, by projections of the bond courses or by similar means, so that the constrictions are narrow next to the chimney draught, and wider further away, the width of these openings being adjustable by means of slides. The heating flues contain an arrangement of nozzles for supplying air and gas so as to mix in a helical column, as is described in Eng. Pat. 17,283 of 1903. (See U.S. Pat. 753,146 of 1904; this J., 1904, 365.)—L. F. G.

Fuel; Artificial —, and the Manufacture thereof. J. J. Shedlock, Colchester. Eng. Pat. 21,300, Oct. 3, 1904.

SEE Fr. Pat. 340,981 of 1904; this J., 1904, 816.—T. F. B.

Coal Gas; Manufacture of —. T. Settle and W. A. Paddfield, Exeter. Eng. Pat. 24,588, Nov. 12, 1903.

THE tar produced on condensing the gas is pumped back continuously, in limited quantities, on to the coal in the retorts, where it forms coke and volatile hydrocarbons. The process is applicable to the vertical retorts described in Eng. Pat. 12,552 of 1902 (this J., 1903, 789).—H. B.

Combustible Gas from Carbonaceous Liquids; Process and Apparatus for Generating a —. F. Cotton, Hornsby, N.S.W. Eng. Pat. 18,291, Aug. 23, 1904.

A CARBONACEOUS liquid, such as the residuum of petroleum, is forced, along with steam, into a cylindrical vessel which acts as a mixing chamber, the steam used having been superheated to such a degree that the temperature within the chamber is about 300° F. The mixture passes through a pipe, closed at the ends but having lateral perforations, into a second cylindrical vessel, arranged coaxially with the first, but insulated from it by means of asbestos or the like. This vessel, which serves as a retort and is maintained at about 800° F., has an outlet nozzle for the combustible gas produced; it is kept at the required temperature preferably by arranging it to project more or less into the combustion chamber of the furnace in which the gas is burned. (See Eng. Pat. 20,234 of 1902; this J., 1903, 485.)—H. B.

UNITED STATES PATENTS.

Gas; Apparatus for the Manufacture of —. C. H. Claudel, Argenteuil, Assignor to Cie. du Carburateur Claudel, Paris. U.S. Pat. 772,131, Oct. 11, 1904.

SEE Fr. Pat. 331,372 of 1903; this J., 1903, 1122.—T. F. B.

Gas Purifier. R. B. Brown, Milwaukee, Wis. U.S. Pat. 771,414, Oct. 4, 1904.

THE gas purifier, which contains the usual grid for supporting the purifying material, is provided with a removable vertical discharge-tube for the spent material, the tube consisting of a number of tube lengths telescoped one within the other and extending down through the purifying material to the covered discharge-opening at the bottom.—H. B.

Electric Heating; Apparatus for — [Carbide Production]. W. S. Horry. U.S. Pats. 771,249 and 771,250, Oct. 4, 1904. XI. A., page 1034.

FRENCH PATENTS.

Briquettes and Agglomerated Combustibles; Manufacture of —. A. A. Chevalier. Fr. Pat. 343,248, May 17, 1904.

A NEW agglutinant, "carbo-cellulose," to which may be added a little sodium nitrate and common salt, is used in the manufacture of briquettes. The "carbo-cellulose" is prepared by treating all sorts of vegetable refuse, such as fibres, wood-shavings, chiffrons, straw, or dried herbs, in a lead-lined chamber through which a lead-covered mixing-screw passes, with sulphuric anhydride for 50 minutes, or with sulphuric acid of 60° B. The cellulose is thereby converted into a black mass, which on moistening becomes viscid and colloidal. A suitable mixture for the briquettes consists of 93.2 parts of anthracitic coal, 5 parts of "carbo-cellulose," 1 part of sodium chloride, and 0.8 part of sodium nitrate.—L. F. G.

Combustible; Manufacture of a — for Heating the Contents of all kinds of Vessels. M. Bamberger and F. Böck. Fr. Pat. 343,724, June 6, 1904.

THE combustible consists of finely-divided metals, such as iron, copper, or zinc, mixed with substances containing oxygen or sulphur, and some indifferent material, such as clay, to retard the combustion. Suitable proportions are: 3 parts of potassium permanganate, 4 parts of iron filings, and 2 parts of dried plaster. The mixture is formed into balls or plates, and can be hardened by first moistening with water, and then drying.—L. F. G.

Siemens Regenerative Furnaces; Process for Avoiding the Loss of Gas in —. A. Kurzwehnart. Addition, dated April 13, 1904, to Fr. Pat. 340,332, Jan. 25, 1904.

SEE Eng. Pat. 8311 of 1904; this J., 1904, 816.—T. F. B.

Gas and Air; Process and Apparatus for Preparing Mixtures of —. Selas Ges. m. b. H. Fr. Pat. 338,967, Aug. 19, 1903.

SEE Eng. Pat. 17,788 of 1903; this J., 1904, 859.—T. F. B.

Gas Generator [for Weak Gas]. L. Genty and Soc. Nouvelle des Etablissements de l'Horme et de la Buire. Fr. Pat. 343,010, May 9, 1904.

THE apparatus comprises a generator, a recuperator, a scrubber, purifiers, and a blower. Low-grade, bituminous fuel is fed into the generator, and descends first through a shoot or retort, and then over a conical deflector into the combustion chamber. Whilst in the retort, the tarry matters are distilled off and are driven, by means of a fan, down a pipe which discharges them into the incandescent zone of the fuel. The gas produced circulates round a steam generator arranged at the top of the apparatus, and then passes in succession through the recuperator, scrubber, and purifiers. The air-supply for the fuel is drawn in over the water in the steam generator, and the mixture of air and steam formed, after passing through the recuperator, enters the combustion chamber. The latter is provided with pokers and movable fire-bars for breaking up the clinker.—H. B.

Generator for Gas, Vapours, or for Supplying Liquids from Closed Vessels. R. Desouches. Fr. Pat. 343,390, May 24, 1904.

THE apparatus is intended for distributing gas for driving motors or automobiles, hot liquids, or melted substances, and consists of a series of closed vessels connected to a common supply pipe. Each vessel is a separate unit and is provided with charging and discharging valves, and with an independent heating arrangement, which may be electric.—L. F. G.

Gas Retorts. E. Derval. Fr. Pat. 343,699, June 4, 1904.

A SLIGHT inward curvature is given to the bottom of the retort, for the purpose of sending the coal to the sides and diminishing the thickness of the charge along the middle line. A longitudinal vertical rib may also be provided, for the same purpose, along the interior side of the bottom.

Transverse ribs are fixed at intervals across the exterior of the bottom, to increase the heating surface of the latter; whilst the top of the retort is made thicker than usual, in order to prevent excessive heating of the gas evolved.

—H. B.

Mineralised Carbons for Arc Lamps. H. Mercier.
Fr. Pat. 343,698, June 4, 1904.

In addition to the usual ingredients employed in the manufacture of mineralised carbon electrodes there is added zinc, or antimony, or a mixture of the two, either in the metallic state or in the form of compounds, such as zinc borate and tartar emetic. These are said to increase the luminosity and steadiness of the arc.—H. B.

III.—DESTRUCTIVE DISTILLATION. TAR PRODUCTS, PETROLEUM AND MINERAL WAXES.

Petroleum; The Hydrocarbons in Ohio Trenton Limestone —, with Boiling Points above 213° C. C. F. Mabery and O. R. Palm. Proc. Amer. Acad. Arts and Sc., 1904, 40, 323—324. (See this J., 1897, 727.)

A LARGE representative sample of Ohio crude oil, having, the sp. gr. 0.8367 at 20° C., and the percentage composition C = 85.46 per cent., H = 13.91 per cent., S = 0.48 per cent., was distilled under ordinary pressure, to remove the fractions boiling below 200° C. The remainder was repeatedly fractionated under a pressure of 30 mm. and furnished the following hydrocarbons:—

Series.	Symbol.	Boiling Point.	Still Pressure.	Sp. Gr. at 20° C.
		° C.		
C_nH_{2n}	$C_{12}H_{24}$	211—213	Atmos. press.	0.7970
	$C_{13}H_{26}$	223—225	"	0.8055
	$C_{14}H_{28}$	138—140	30 mm.	0.8129
	$C_{15}H_{30}$	152—154	"	0.8204
	$C_{16}H_{32}$	164—168	"	0.8254
	$C_{17}H_{34}$	177—179	"	0.8335
C_nH_{2n-2}	$C_{18}H_{34}$	198—202	"	0.8364
	$C_{19}H_{36}$	213—217	"	0.8417
	$C_{20}H_{38}$	224—227	"	0.8414
	$C_{21}H_{40}$	247—249	"	0.8539
C_nH_{2n-4}	$C_{22}H_{40}$	253—255	"	0.8542
	$C_{23}H_{42}$	263—265	"	0.8561
	$C_{24}H_{44}$	275—278	"	0.8612

None of the fractions showed evidence of decomposition. The lower-boiling ones were liquid, but that distilling at 213°—217° C. was nearly solid at ordinary temperatures, and the higher distillates were quite solid owing to their high paraffin content (33—50 per cent.). In refining the heavy distillates, gasoline was used as a solvent, the oils otherwise forming a persistent emulsion under the acid treatment. The above composition of the fractions explains the high specific gravity of the crude oil and distillates. The C_nH_{2n} series is probably composed of the methylene hydrocarbons, perhaps with complex side chains; and the series still poorer in hydrogen may contain two or more methylene rings.—C. S.

Petroleum; The Hydrocarbons in Canadian —, with High Boiling Points. C. F. Mabery and E. T. Numsen. Proc. Amer. Acad. Arts and Sc., 1904, 40, 334—340.

HYDROCARBONS of the series C_nH_{2n} , from $C_{12}H_{24}$ to $C_{15}H_{30}$ were isolated from the fractions boiling above 216° C., a lower member of the series, viz., $C_{11}H_{22}$, boiling at 196° C., having been obtained previously; whereas in Pennsylvania oil the series begins with $C_{17}H_{34}$, and in Ohio oil with $C_{15}H_{30}$ (see preceding abstract). The prevalence of this series, and of others still poorer in hydrogen, accounts for the higher sp. gr. of Canadian crude and refined oils.—C. S.

[Petroleum] Crude Oil; Hydrocarbons in Santa Barbara —. C. F. Mabery and C. V. Zoul. Proc. Amer. Acad. Arts and Sc., 1904, 40, 340—346.

THE specimen of oil examined was from a submarine well. It was of the consistency of heavy tar, with the sp. gr. 0.9645

at 20° C., and contained 0.84 per cent. of sulphur, 1.25 per cent. of nitrogen, 86.32 per cent. of carbon, and 11.70 per cent. of hydrogen, a composition indicating the prevalence of hydrocarbons poor in hydrogen. When distilled under a pressure of 60 mm., only small quantities passed over below 175° C. A residue of 10 per cent. of the original quantity remained behind at 365° C. The following hydrocarbons were isolated:—

	Boiling Point at 60 mm. Pressure.	Sp. gr. at 20° C.
	° C.	
$C_{12}H_{24}$	150—155	0.8621
$C_{13}H_{26}$	175—180	0.8908
$C_{14}H_{28}$	190—195	0.8919
$C_{15}H_{30}$	210—215	0.8995
$C_{16}H_{32}$	250—255	0.9294
$C_{17}H_{34}$	310—315	0.9451
$C_{18}H_{36}$	340—345	0.9778

The presence of these hydrocarbons explains the peculiar character of the oil, which is unlike any other examined by the authors, and affords an explanation of the conversion of petroleum, by slow evaporation, into natural tars and asphaltums.—C. S.

Paraffin Hydrocarbons; Separation of Solid — from Petroleum without Distillation. C. F. Mabery and O. J. Sieplein. Proc. Amer. Acad. Arts and Sc., 1904, 40, 346—349.

By exposing 3 kilos. of Pennsylvania crude oil, in a shallow pan, to a powerful current of air for 30 days, 66.67 per cent. volatilised, the amount of residue being equal in quantity to that left on distillation up to 300° C. No further loss occurred on prolonging the exposure for a year. The crude oil contained 75.51 per cent. of carbon and 14.18 per cent. of hydrogen, whilst the residue contained 86.16 per cent. of carbon and 18.69 per cent. of hydrogen. The residue solidified when cooled by ice, and it furnished on distillation 28 per cent. of a fraction passing over below 300° C., 6 per cent. at 300°—360° C., and a residue of 66 per cent. at the latter temperature. The solid hydrocarbons were determined by the Zoloziecki method: extracting the residue with fusel oil, precipitating with alcohol, washing with a mixture of the two agents, extraction with benzene, and heating to 140° C. for an hour to expel the last traces of fusel oil. This treatment furnished 39.6 per cent. of a greenish-black solid melting at 32° C. Treatment with fusel oil and alcohol gave a light-brown solid melting at 57° C., which, after purification with ether and alcohol, yielded a white product melting at 61° C. and having the sp. gr. 0.7966 at 70° C. The percentage composition was: carbon, 85.37 per cent.; hydrogen, 14.69 per cent. These results show that solid paraffin hydrocarbons are present in Pennsylvania crude oil, as natural constituents and that they are not distillation products. Any decomposition during distillation results in an elimination of hydrogen and the conversion of the hydrocarbons into a lower series.

—C. S.

[Petroleum] Paraffin Hydrocarbons; Solid — that Collect in certain Oil Wells in Pennsylvania. C. F. Mabery. Proc. Amer. Acad. Arts and Sc., 1904, 40, 349—355.

IN certain of the Pennsylvania oil wells, especially those around Coreopolis, a light-yellow pasty mass is found in considerable quantities, and is utilised for the production of vaseline, &c. No solid matter can be separated from the mass by filtration or pressure; and it evidently consists of an emulsion and partial solution of heavy oil fractions and solid hydrocarbons, left by evaporation of the lighter constituents. The sample examined had the sp. gr. 0.8345 at 60° C., and furnished distillates passing over between 195° and 342° C. (50 mm.), leaving a residue of about 31 per cent. of the original mass. The separation of the solids in the cooled distillates was effected by solution in alcohol-ether, followed by re-cooling and filtration; and

by this means the following solid hydrocarbons were identified:—

Hydrocarbon.	Symbol.	Melting Point.	Sp. Gr.
Tetracosane.....	$C_{24}H_{50}$	50°—51° C.	0.7800 at 65° C.
Hentriacontane.....	$C_{31}H_{64}$	66° C.	0.7897 at 70° C.
Dotriacontane.....	$C_{32}H_{66}$	67°—68° C.	0.8005 at 75° C.
Tetriacontane.....	$C_{33}H_{68}$	71°—72° C.	0.8009 at 80° C.
Pentatriacontane ..	$C_{35}H_{72}$	76° C.	0.8952 at 80° C.

The oils separated by filtering the distillate seem to belong chiefly to the series C_nH_{2n+2} , with small amounts of hydrocarbons of a series still poorer in hydrogen. It is pointed out that the freezing point of benzene cannot be relied on for molecular weight determinations of solids much above $C_{20}H_{42}$, and even at its boiling point this solvent becomes uncertain with hydrocarbons in the vicinity of $C_{30}H_{62}$. Other solvents are equally uncertain, and naphthalene is unreliable for substances with melting points approximating to its own.

—C. S.

Paraffin; Composition of Commercial — C. F. Mabery and H. R. Payne. Proc. Amer. Acad. Arts and Sc., 1904, 40, 355—360 (see this J., 1902, 1271).

To determine whether the hydrocarbons of commercial paraffin are identical with the solid constituents of the oils yielding that substance, a sample of commercial paraffin was distilled under a pressure of 40 mm., care being taken to prevent decomposition by precluding the admission of air. The first fraction collected below 250° C.; and the final slightly brown residue, remaining at 350° C., weighed only 2 per cent. of the total substance (1,500 grms.). The distillates collected in larger quantities at temperatures corresponding to those of hydrocarbons separated from crude oil, viz., 256°—258° C., 90 grms.; 272°—274° C., 45 grms.; 282°—284° C., 70 grms.; 292°—294° C., 30 grms.; 316°—318° C., 35 grms.; 332°—334° C., 20 grms.; 346°—348° C., 40 grms. In addition to the hydrocarbons previously identified in paraffin by one of the authors (*loc. cit.*) nonacosane was found; but the melting points exhibit certain differences, viz., tricosane, 48° C. (instead of 45° C.); tetracosane, 50°—51° C. (48° C.); pentacosane, 53°—54° C. (no change); hexacosane, 55°—56° C. (58° C.); octacosane, 60° C. (no change); nonacosane, 62°—63° C. The solid hydrocarbons forming the bulk of commercial paraffin are evidently members of the series C_nH_{2n+2} , and none of them, capable of being distilled, contain oxygen; nor is it reasonable to assume that they have been formed by "cracking," this operation furnishing hydrocarbons of lower molecular weights.—C. S.

Vaseline, Cosmoline, and similar Products; Composition of Commercial — C. F. Mabery. Proc. Amer. Acad. Arts and Sc., 1904, 40, 361—362.

One hundred grms. of vaseline distilled under a pressure of 15 mm. furnished 14 grms. of distillate up to 250° C., 22 grms. at 250°—275° C., 14 grms. at 275°—300° C., 18 grms. at 300°—325° C., 7 grms. at 325°—350° C., 20 grms. at 350°—360° C., and 6 grms. of residue. All the distillates were pale yellow, with a slight fluorescence when melted. The first fraction was a heavy viscous liquid, the others semi-solid, and the residue brown. By treating the second and final fractions with ether and alcohol, solid hydrocarbons, melting at 70° C. and 77°—78° C. respectively, were obtained, resembling the solid paraffin hydrocarbons. Vaseline therefore consists of heavy oils of the series C_nH_{2n+2} , C_nH_{2n-2} , and C_nH_{2n-4} , with solid paraffin hydrocarbons, the latter being sufficient in quantity to saturate the former and produce an emulsion. Refinery "scale" paraffin consists of solid hydrocarbons of the series C_nH_{2n+2} , and heavy oils of the above-named series, in which they are more soluble than in the lighter oils of their own series.—C. S.

Indophenine Reaction. F. W. Bauer. XXIII., page 1047.

UNITED STATES PATENTS.

Wood; Process of Destructive Distillation of Resinous — C. E. Broughton, Savannah, Ga. U.S. Pat. 771,706, Oct. 4, 1904.

RESINOUS wood is treated in a retort with superheated steam under pressure, at a temperature of about 800° F., whereby the light turpentine oils are removed "without being rendered empyreumatic"; the temperature is now raised to 450°—500° F. by application of external heat, steam being still injected, and the distillate is collected in suitable fractions. When no further distillation occurs, the heating is continued by external means alone, at a temperature of about 800° F.; the creosote and tar oils are collected, as before, in suitable fractions; and the tar is drawn off from time to time, thus leaving pure charcoal in the retort at the completion of the process.—T. F. B.

Ammonium Sulphate; Saturating Apparatus for Recovering — K. Zimpell, Stettin, Germany. U.S. Pat. 772,390, Oct. 18, 1904.

See Eng. Pat. 6891 of 1904; this J., 1904, 660.—T. F. B.

FRENCH PATENT.

Tarring or Asphalting Roads; Product for —, and Process for its Manufacture. L. Préaubert and G. A. Thubé. Fr. Pat. 342,898, May 5, 1904. IX., page 1029.

IV.—COLOURING MATTERS AND DYE STUFFS.

Trinitroxylenol; Symmetrical — E. Knecht and E. Hibbert. Ber., 1904, 37, 3477—3479.

FIVE grms. of pure symmetrical xylenol were dissolved in 50 c.c. of equal parts of ordinary and of 20 per cent. fuming sulphuric acid, and warmed for 15 minutes on the water-bath. After cooling, 11.6 grms. of nitric acid of sp. gr. 1.415 were added, and the whole warmed on the water-bath after standing for some time. It was then poured into 300 c.c. of water. The precipitate was filtered, washed, and dissolved in boiling water, there being a slight insoluble residue. On adding potassium chloride in excess to the hot solution, the potassium salt of trinitroxylenol crystallised out in brownish-yellow crystals, from which the free acid was liberated by boiling dilute hydrochloric acid, and recrystallised from water. It is less soluble in water than picric acid, and dyes wool in redder shades in contrast to the corresponding trinitrocresol, which gives very greenish-yellow dyeings. It gives no reaction with potassium cyanide, whereas picric acid gives the isopurpuric acid reaction and trinitrocresol an orange-red coloration.

—E. F.

Phenyldiazoaminobenzene; Substituted Derivatives of —. L. Vignon and Simonet. Comptes rend., 1904, 139, 569—571.

SUBSTITUTED derivatives of phenyldiazoaminobenzene were easily obtained by combining substituted phenyldiazonium chlorides with diphenylamine in alcoholic solution in presence of sodium carbonate at 4°—5° C. Descriptions are given of the substances obtained from the diazo derivatives of the following amines:—*o*-, *m*-, and *p*-nitraniline; *o*-, *m*-, and *p*-chloraniline; 1,2,4-dichloraniline; 1,2,4,6-trichloraniline; *o*-, *m*-, and *p*-bromaniline; 1,2,6-dibromaniline; 1,2,4,6-tribromaniline; *p*-iodoaniline; 1,2,4-diiodoaniline; *o*- and *p*-anisidine. All these compounds possess the general properties of diazo-amino compounds. In general, they are unstable, the stability apparently increasing with the number of substituent groups.

—T. F. B.

***p*-Phenylenediamine; Oxidation Products of —.** E. Erdmann. Ber., 1904, 37, 2906—2913. (See this J., 1904, 885.)

HYDROGEN peroxide solution acts on a dilute aqueous solution of *p*-phenylenediamine to form a substance of the formula $(C_6H_4N_2)_x$, which was found to be identical with

Baudrowski's base. The reaction thus proceeds according to the equation: $3C_6H_4(NH_2)_2 + 3H_2O_2 = C_{18}H_{18}N_6 + 6H_2O$. The formula of Baudrowski's base is probably—



On oxidising *p*-phenylenediamine solution with hydrogen peroxide whilst boiling, ammonia is formed, and also a volatile substance, causing coughing, which was found to be quinone-di-imide. When very dilute solutions of *p*-phenylenediamine are treated with 1 molecule of lead peroxide paste below 12° C., quinone di-imide is formed. The solution is yellow, turns brown when spotted on paper, gives a green coloration with dilute acids, and gives the indamine reaction with aniline hydrochloride. After standing for some time, the indamine reaction can no longer be obtained, and on acidification and evaporation, a safranine-coloured liquid is obtained, from which, after evaporation almost to dryness, alcohol extracts a yellowish-red fluorescent dyestuff with the properties of phenosafranine. The solution of quinone-di-imide obtained from *p*-phenylenediamine solution and lead peroxide yields quinone on pouring into dilute sulphuric acid, and *p*-phenylenediaminesulphonic acid with sodium bisulphite solution. Quinone-di-imide irritates the respiratory organs strongly, and is also a strong poison. It therefore demands care in handling, especially as it is volatile.—E. F.

Hydroxyfuchsones. F. Sachs and R. Thonet. Ber., 1904, 37, 3327—3334.

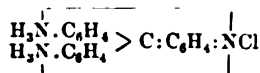
BENZOPHENONE chloride was condensed with pyrocatechol in presence of concentrated sulphuric acid, 3,4-dihydroxytriphenylcarbinol ($C_6H_5)_3C(OH)C_6H_3(OH)_2$ being thus formed. On heating, for two hours, to 80°—105° C., this substance loses 1 molecule of water, and forms the quin-2-hydroxyfuchson ($C_6H_5)_3C:C_6H_3(OH):O$, a dark-orange powder. This compound dyes wool in yellowish-brown shades, intensified by subsequent treatment with copper sulphate or potassium bichromate. It dyes brown on alumina mordant, brownish-black on chrome, and violet-black on iron mordant; it also dyes on zinc, uranium, cerium, nickel, cobalt, zirconium, and yttrium mordants. Benzoylveratrol was condensed with pyrocatechol in presence of aluminium chloride, to form 3,4-dihydroxy-3',4'-dimethoxytriphenylcarbinol ($C_6H_5)(OH)C[C_6H_3(OH)_2][C_6H_3(OCH_3)_2]$, which is very similar in properties to the nonmethoxylated carbinol. It dyes on mordants, and loses water at 80° C., forming the fuchson. Michler's ketone was converted into the corresponding chloride, and condensed with pyrocatechol in presence of strong sulphuric acid. Liebermann's Proto-blue $[(CH_3)_2N.C_6H_4]_2C.[C_6H_3(OH)_2]OH$ was thus formed.—E. F.

Triphenylmethane Dyestuffs; Nature of the Bases of —. A. Hantzsch. Ber., 1904, 37, 3434—3440.

THE author criticises Baeyer and Villiger's views as to the nature of the bases of triphenylmethane dyestuffs (this J., 1904, 862), and points out that the electrical conductivity of solutions of salts of these dyestuffs to which caustic soda solution has been added indicates the presence of true ammonium bases of the type $R_2 : C : C_6H_4 : NH_2OH$. These gradually split off water to form anhydrides $R_2 : C : C_6H_4 : NH$, the so-called "bases" of Baeyer and Villiger. According to the modern dissociation theory a true base must contain a hydroxyl group which is dissociated in aqueous solution to form a hydroxyl ion.—E. F.

Rosaniline Salts; Constitution of — and the Mechanism of their Formation. J. Schmidlin. Comptes rend., 1904, 139, 602—604.

In place of the quinonoid formula proposed by Fischer and Nietzki for rosaniline mono-acid salts, the author suggests the following:—



where the three nitrogen atoms are united in a so-called "triazine chain." By the use of this formula, the mechanism of the transformation of these salts into the unstable tri-acid salts, and then to the stable, colourless salts of tetrahydroxy-cyclohexanerosaniline with excess of acid, and also the transformation of rosaniline carbinol in presence of acetic acid into the colourless salt and then into the coloured rosaniline salt, are easily explained (see this J., 1904, 979). —T. F. B.

Naphthol Yellow S. E. Knecht and E. Hibbert. Ber., 1904, 37, 3475—3477.

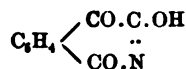
DINITRO- α -NAPHTHOLSULPHONIC acid was recrystallised repeatedly from concentrated hydrochloric acid. As so obtained the free acid contains 3 mols. of water of crystallisation. It is very soluble in water and in alcohol. The normal potassium salt has the formula $C_{10}H_7(OK)(SO_3K)(NO_2)_2 + 1\frac{1}{2}H_2O$, and is much more soluble in water than the technical product. It was not found possible to obtain a monopotassium salt. The sodium salt crystallises with 3 mols. of water, and is much more soluble than the potassium salt. The ammonium, calcium, magnesium, silver, aniline, and *p*-nitraniline salts were also prepared and are described.—E. F.

Immedial Pure Blue. R. Gnehm and F. Kaufer. Ber., 1904, 37, 3032—3033.

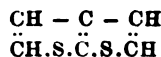
IN a previous communication (this J., 1904, 781) the authors described a substance obtained by brominating Immedial Pure Blue, which they concluded to be tetrabromodimethylaminothiazone. They have now obtained the same substance, with identical properties, by brominating Bernthsen's Methylene Violet, which is dimethylaminothiazone, obtained by treating Methylene Blue with silver oxide. This result confirms the authors' previous conclusions.—E. F.

Indophenines; Some New —. H. Oster. Ber., 1904, 37, 3348—3352.

NITRO-INDOPHENINE ($C_6H_4[NO_2]NO)(C_6H_5S)$ was obtained in the usual manner from nitro-isatin and thiophen. It is a dark-blue powder, soluble in concentrated sulphuric acid with a pure blue colour, and almost insoluble in other media. Carbindophenine ($C_6H_4NO_2)(C_6H_5S)$ was made by condensing thiophen with phthalone-imide—



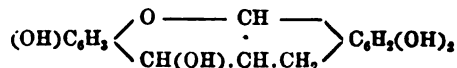
the oxidation-product of carbindigo. It is deep blue and has very similar properties to nitro-indophenine. Mono-isatin-indophenine ($C_6H_4NO)(C_6H_5S_2)$ was obtained by condensing equimolecular amounts of isatin and thiophen—



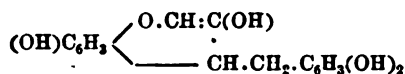
It forms a grey powder. If thiophthen is condensed with excess of isatin in presence of a large quantity of sulphuric acid, di-isatinindophenine ($C_6H_4NO)_2(C_6H_5S_2)$ is formed; it is a dark-blue powder. Monobromo-indophenine, from monobromo-isatin and thiophthen, and carbindophenine, from phthalone-imide and thiophthen, were also prepared. Phenanthraquinone was also condensed with both thiophen and thiophthen. The products are green powders, soluble in concentrated sulphuric acid to a dirty-green solution, instead of the bright blue of the indophenines.—E. F.

Brasilin and Hamatoxylin. J. Herzig and J. Pollak. Monatsh. Chem., 1904, 25, 871—898.

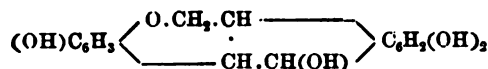
THE authors discuss the different formulae which have been proposed for Brasilin, viz.,



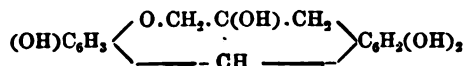
by Perkin (this J., 1902, 110),



or



by Kostanecki (this J., 1899, 677, and Ber., 1902, 35, 1667), and



by Werner and Pfeiffer (Chem.-Zeits., 1904, 3, 390, 420). None of these formulae are considered by the authors to be satisfactory, but they think that there is a possibility of numerous tautomeric and also of stereoisomeric forms. They criticise Kostanecki and Lloyd's statement that the two isomers $\text{C}_{16}\text{H}_{12}\text{O}(\text{OH})_2$ cannot be stereoisomers, because they behave differently on reduction and oxidation (see this J., 1903, 902). With cold concentrated sulphuric acid trimethylbrasilone yields an isomer which contains a very acid hydroxyl group, is partially precipitated from alkaline solution by carbon dioxide, and does not react with hydroxylamine hydrochloride to form an oxime. It is very readily alkylated. The monomethyl ether does not split off water with acetic anhydride and sodium acetate, and can be readily saponified by alkali, with formation of its mother-substance. The corresponding products from tetramethyl-hæmatoxylin are very similar in properties.—E. F.

Chromophors; Ionisation of — H. Decker.
Ber., 1904, 37, 2938—2941.

Certain ammonium-, oxonium-, and thionium-iodides and bromides are coloured in the solid state, but are decolorised by solution in a large quantity of water, owing to dissociation into colourless ions. In these cases iodine and bromine form chromophoric groups with pentavalent nitrogen or quadrivalent sulphur or oxygen. A chromophoric group is only formed if the nitrogen itself forms part of an aromatic ring. Thus the aliphatic ammonium iodides and dimethyldiphenylammonium iodide are colourless, whereas pyridiniummethyl iodide is yellow. The iodo-alkylates of quinoline and isoquinoline are still more strongly coloured. The colour is intensified by the introduction of bromine- and nitro-groups into the aromatic nucleus, orange to garnet-red bodies being thus formed. 6.8-Dinitroquinolinemethyl iodide forms reddish-black needles which give a colourless solution in water. 5-Nitroquinolinemethyl iodide forms a red solution in alcohol or in a small amount of water. If portions of such a solution are diluted to an equal extent with alcohol and with water, it is found that the water causes decolorisation, whereas the alcohol only does so to a small extent, showing that its power of ionising the substance is very much smaller. A solution of the same compound in chloroform is raspberry-red in colour, and the colour is unchanged on addition of more chloroform, but is completely destroyed by shaking up with water, which dissolves and ionises the iodide. The corresponding compounds of the acridinium series are still more highly coloured, even the ion of methylacridinium possessing a yellow colour. The highly-coloured salts in this case show on dissociation the pale-yellow colour of the ion. The introduction of phenyl groups increases the intensity of the colour. Thus *ms*-phenylacridine is slightly coloured. Its tertiary and quaternary salts are strongly yellow in colour, and the latter dye animal fibres.—E. F.

Rosaniline and Pararosaniline; Method of Rapidly Dis-tinguishing between — R. Lambrecht and H. Weil.
XXIII., page 1047.

Magnesium Amalgam as a Reducing Agent. T. Evans and W. C. Fetsch. XX., page 1041.

ENGLISH PATENTS.

***o*-Nitro-*o*-amido-*p*-acetamidophenol, and Dyestuffs** [Azo-dyestuffs] therefrom; Manufacture of — R. B. Ransford, Upper Norwood. From L. Cassella and Co., Frankfurt-on-Maine, Germany. Eng. Pat. 24,409, Nov. 10, 1903.

p-ACETAMINOPHENOL is energetically nitrated in strong sulphuric acid solution. Dinitroacetaminophenol ($\text{OH}:\text{NO}_2:\text{NHCOCH}_3:\text{NO}_2 = 1:2:4:6$) is thus formed. On reduction with suitable reagents, such as alkali sulphides, this compound yields *o*-nitro-*o*-amino-*p*-acetaminophenol. On diazotisation this latter compound is transformed into an orange-yellow diazo-compound, which combines with the sulphonic acids of aminonaphthols and dihydroxynaphthalenes to form dyestuffs which dye wool in even blue shades, changing to bluish-green on subsequent chroming, these latter shades being very fast to washing, milling, and light.—E. F.

Oxyanthraquinones [Erythrohydroxy-anthraquinone, Anthrarufin, and Chrysazin]; Manufacture of — H. E. Newton, London. From Farbenfabr. vorm. F. Bayer and Co., Elberfeld, Germany. Eng. Pat. 25,541, Nov. 23, 1903.

SEE Fr. Pat. 336,867 of 1903; this J., 1904, 438.—T. F. B.

Azo Colouring Matters; Manufacture of New —, and of Colour Lakes therefrom. H. E. Newton, London. From Farbenfabr. vorm. F. Bayer and Co., Elberfeld, Germany. Eng. Pat. 28,563, Dec. 29, 1903.

SEE Fr. Pat. 337,942 of 1903; this J., 1904, 543.—T. F. B.

Ink. W. Rosenhain, Birmingham. Eng. Pat. 26,951, Dec. 9, 1903.

AN ink, suitable for writing upon very smooth surfaces, is prepared by adding the necessary colouring matter (preferably in the form of a metallic oxide) to a solution containing sodium aluminate and sodium silicate. This solution is best prepared by adding 40 grms. of a 2.5 per cent. solution of sodium aluminate to 150 grms. of strong commercial sodium silicate solution and 20 cc. of water.

—T. F. B.

UNITED STATES PATENT.

Anthracene Dyestuff. R. Bohn, Mannheim, Assignor to Badische Anilin und Soda, Fabrik, Ludwigshafen-on-Rhine. U.S. Pat. 767,259, Aug. 9, 1904.

By melting with alkali hydroxide, diaminoanthraquinones, or their sulphonic acids, dyestuffs are obtained very similar in properties to Indanthrene, which dye brown shades, turning grey on exposure to air, from hydrosulphite solutions in presence of alkali; the shades obtainable are very fast; the dyestuffs from 1.5- and 1.8-diamino-anthraquinones give reddish-grey shades, whilst those from the 1.3-, 2.6-, and 2.7-derivatives give greenish-grey shades.

—T. F. B.

FRENCH PATENTS.

Acetyldiaminophenolsulphonic Acid and a Bluish-Black [Azo] Dyestuff for Wool, susceptible to Chroming, derived therefrom; Process for Producing an —. Manuf. Lyon. Mat. Col. First Addition, dated July 20, 1903, to Fr. Pat. 337,011, Feb. 4, 1903.

SEE Eng. Pat. 17,792 of 1903; this J., 1904, 782.—T. F. B.

Acetyldiaminophenolsulphonic Acid and a Bluish-Black [Azo] Dyestuff for Wool, susceptible to Chroming, derived therefrom; Process for Producing an —. Manuf. Lyon. Mat. Col. Second Addition, dated July 24, 1903, to Fr. Pat. 337,011, Feb. 4, 1903.

SEE Eng. Pat. 3182 of 1903; this J., 1904, 56.—T. F. B.

Monazo Dyestuffs susceptible to Chroming on the Fibre; Production of —. Badische Anilin und Soda Fabrik. Fr. Pat. 338,960, July 30, 1903.

SEE Eng. Pat. 16,995 of 1903; this J., 1904, 712.—T. F. B.

o-Hydroxyazo Dyestuffs [Azo Dyestuffs] capable of being Chromed on the Fibre; Production of —. Soc. Badische Anilin und Soda Fabrik. First Addition, dated Feb. 26, 1904, to Fr. Pat. 333,819, Dec. 17, 1903.

In the process described in the main patent (this J., 1904, 820) an α -naphthylaminodi- or trisulphonic acid is diazotised and the diazo compound converted into an *o*-hydroxydiazo compound by standing in neutral, weakly acid or weakly alkaline solution. In this process sulphurous acid is liberated which partially prevents the *o*-hydroxydiazo compound from combining to form azo dyestuffs. This is avoided, according to the present additional patent, by effecting the change in presence of chlorine or an alkali hypochlorite, or by acting on the diazosulphonic acid with these reagents. The resulting hydroxydiazo compound is then treated in the usual manner.—E. F.

Dyestuffs of the Anthracene Series [Anthracene Dyestuffs]; Production of —. Soc. Anon. des Prods. F. Bayer et Cie. Fr. Pat. 343,608, March 29, 1904.

1-AMINO-2-HALOGENO-ANTHRAQUINONE, 2-amino-1-halogeno-anthraquinone, or their derivatives, are treated with a metallic salt, such as cupric or zinc chloride, in presence of solvents or diluting agents. The presence of weakly basic compounds such as sodium acetate is advantageous. The products, which are the derived hydrazines of anthraquinone, are transformed by alkaline reducing agents into hydrogenated products, which are used for printing and dyeing cotton by the same methods as are used in the case of indigo. Bright and fast blue to green shades are so obtained.

Dyestuff obtained with—	Shade on Unmordanted Cotton.
1-Amino-2-bromoanthraquinone.	Blue.
1-Methylamino-2-bromoanthraquinone.	Pure blue.
1,4-Diamino-2-bromoanthraquinone.	Olive-green.
1,4-Diamino-2,3-dibromoanthraquinone.	Green.
1-Amino-2-bromo-5-nitroanthraquinone.	Bluish-grey.
1-Amino-2-bromo-4- <i>p</i> -toluidioanthraquinone.	Olive-green.
1,3-Dibromo-2-aminoanthraquinone.	Greenish-blue.

—E. F.

Black Dyestuff [Sulphide Dyestuff] for Cotton; Production of —. M. K. Oehler. Fr. Pat. 343,282, May 18, 1904.

4-AMINO-3-CHLORO-2',4'-DINITRODIPHENYLAMINE, obtained by condensing chloro-*p*-phenylenediamine with 1-chloro-2,4-dinitrobenzene, is melted with sulphur and sodium sulphide. The dyestuff so obtained dyes wool in very fast shades which become brighter and bluer by treatment with oxidising agents on the fibre.—E. F.

Green Sulphide Dyestuffs; Preparation of —. Fabr. de Prods. Chim. ci-d. Sandoz. Fr. Pat. 343,377, May 21, 1904.

1-ALPHYL-4-*p*-HYDROXYALPHYLNAPHTHYLENEDIAMINE sulphonic acids are heated with sulphur and sodium sulphide with or without the addition of copper or of copper salts. It is found that the most suitable compounds to use are the leuco-compounds of sulphonated indophenols formed by the simultaneous oxidation of *p*-aminophenol or chloro-*p*-aminophenol and phenylated or tolylated 1-naphthylamine-6, 7, or 8 monosulphonic acids. The employment of alkylylated derivatives containing chlorine or methyl groups is not advantageous. The products dissolve in water forming bluish-green to yellowish-green solutions, from which they are precipitated both by acids and by excess of alkali hydroxide. They dissolve in concentrated sulphuric acid, to form steel-blue solutions. The products obtained from 1-*p*-hydroxyphenyl-4-naphthylenediamine-8-sulphonic acid dyes cotton in bright bluish-green, that from 1-*p*-hydroxyphenyl-4-naphthylenediamine-6 (or 7-) -sulphonic acid in yellowish-green shades.—E. F.

Lakes [from Azo Dyestuffs]; Process for Preparing New —. Soc. Anon. Prod. F. Bayer et Cie. Fr. Pat. 343,631, June 1, 1904. XIII. A., page 1036.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

ENGLISH PATENTS.

Dyeing Vats [for Bobbins]. T. de Naeyer, Alost, Belgium. Eng. Pat. 20,942, Sept. 29, 1903. Under Internat. Conv., Oct. 7, 1902.

THE principal feature of the vat is that the dye-bath is admitted to it on a surface considerably larger than the outer one, so that, by circulating the liquid by means of a force pump, pressure is produced. The bobbins are packed horizontally in the vat, which is preferably of conical form, and which is provided with a lid or cover, openings in which serve for the introduction of the dyeing liquid; this cover is also provided with a flat, perforated plate, so as to ensure even distribution of the liquid in the vat, the bottom of which is also in the form of a perforated plate. The liquid is contained in a jacketed boiler, over which the vat is mounted, the joints being made air tight. The force pump abstracts the hot liquid from a tube in the bottom of this boiler. This ensures that the dye-bath is not diluted by steam. The interstices between the bobbins in the vat are filled by means of "partial diaphragms" of special form, which are the subject of one of the claims of this specification. (Compare Fr. Pat. 334,828 of 1903; this J., 1904, 185.)

—T. F. B.

Dyeing, Bleaching, Degreasing, and Mercerizing Textile Materials; Apparatus for —. T. de Naeyer, Alost, Belgium. Eng. Pat. 20,959, Sept. 30, 1903. Under Internat. Conv., Dec. 31, 1902.

THE apparatus is similar in principle and form to that described in Eng. Pat. 20,943 of 1903 (see preceding abstract). In addition to the various features therein described, the discharge aperture of the vat is provided with an automatic valve or cock, which, by means of a lever and weight, maintains the aperture closed until the desired pressure is reached, when the valve is opened, and the pressure is reduced, in order to obtain normal circulation of the liquid, thus ensuring uniform treatment. Pressure gauges, water level, and thermometers are also provided for facilitating the control of the process.—T. F. B.

Bleaching Textile Fabrics and Fibres. J. Wakefield, Cockermouth, Cumberland. Eng. Pat. 26,521, Dec. 4, 1903.

VEGETABLE fibres or fabrics are bleached by treatment, first in a bath containing bleaching powder and alkali permanganate, and then in an acidified solution of sodium bisulphite.—T. F. B.

UNITED STATES PATENTS.

Dyeing Cops; Apparatus for —. R. Rawson and E. Lodge, Huddersfield. U.S. Pat. 772,581, Oct. 18, 1904.

SEE Eng. Pat. 10,035 of 1903; this J., 1904, 543.—T. F. B.

Printing with Indanthrene. P. Jeanmaire, Mülhausen, and R. Bohn, Mannheim, Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen-am-Rhine, Germany. U.S. Pat. 772,237, Oct. 11, 1904.

SEE Fr. Pat. 313,772 of 1901; this J., 1902, 342.—T. F. B.

Orthonitrophenyllactoketone; Printing Compounds of —. S. Eichhart, St. Fons, Assignor to Soc. Chim. Usines du Rhône, Ancien. Gilliard, P. Monnet et Cartier, Lyons France. U.S. Pat. 772,560, Oct. 18, 1904.

SEE Eng. Pat. 9336 of 1902; this J., 1903, 362.—T. F. B.

Oxidising Sulphur Dye [Sulphide Dyestuffs on the Fibre] H. J. Cooke, New York, Assignor to A. Klipstein and Co., East Orange, N.J. U.S. Pat. 769,059, Aug. 30, 1904.

SULPHIDE dyestuffs are oxidised on the fibre by means of ozone, produced by the action of air on essential oils, such

as turpentine oil, pine oil, cedar oil, &c. The dyed yarn or fabric is preferably supported in a closed chamber maintained at a temperature of about 60° C.; cotton wool saturated with the oil (e.g., turpentine) is contained in a small adjoining chamber, and a current of steam or air is blown through it, towards the large chamber; the oil thus condenses on the fabric, and the dyestuff is oxidised by the ozone produced. The current of steam or air is preferably stopped when the fabric has received about 1 per cent. of its weight of the oil.—T. F. B.

Waterproofing Fabrics; Compound for —. W. M. Mackintosh, Liverpool. U.S. Pat. 771,257, Oct. 4, 1904.

See Eng. Pat. 218 of 1903; this J., 1904, 184.—T. F. B.

FRENCH PATENTS.

Fulling Woollen Fabrics and other Substances adapted to be Felted. A. Eloegui. Fr. Pat. 343,819, June 9, 1904. Under Internat. Conv., April 11, 1904.

See Eng. Pat. 13,090 of 1904; this J., 1904, 898.—T. F. B.

Decolorising all Kinds of Fabric, Hair, and Skin.

C. Ferry and S. Cognet. Fr. Pat. 343,642, June 2, 1904.

IMPERFECTLY dyed fabrics, hair, skins, &c., are, it is stated, decolorised, restored to more perfect colours by immersing them in a boiling bath consisting of water, 100 litres; soap, 200 grms.; potassium carbonate, 500 grms.; carbon bisulphide, 500 grms.; hydrogen peroxide, 3 kilos.; sodium silicate, 2 kilos. The material is dried without washing, and is then ready for any subsequent treatment. Should the original material have been dyed with some "more or less fast" colour, it is treated in a solution of hydrogen peroxide and sodium silicate, or in a bath of soap, potassium carbonate, and carbon bisulphide.—T. F. B.

Blue and Blue-Black Shades [on Wool] Fast to Fulling and Light; Production of —. Badische Anilin und Soda Fabrik. Addition, dated May 20, 1904, to Fr. Pat. 342,026, April 8, 1904. Under Internat. Conv., April 28, 1904.

FAST blue or blue-black shades are obtained on wool by dyeing with a mixture of Acid Alizarin R (diazotised *o*-nitro-*o*-aminophenol-*p*-sulphonic acid coupled with β -naphthol) and Acid or Alkaline Violet, and subsequently chroming, instead of using, with one of the latter dyestuffs, any of the *o*-hydroxyazo dyestuffs mentioned in the principal patent (see this J., 1904, 899).—T. F. B.

Waterproof Fabric for Wrapping, &c. Bourdu & Co. Fr. Pat. 343,240, May 17, 1904.

THE fabric to be rendered waterproof is first coated with gum and passed between cylinders, and then immersed in a composition of rosin and rosin oil, 70 parts; "heavy oil," 15 parts; and gum benzoin, 15 parts; and dried in the open air.—T. F. B.

Sizing Apparatus for Warps, of Large Output. C. Vandamme. Fr. Pat. 343,801, June 8, 1904.

THE essential feature of this apparatus is that it contains at least 30 heating tubes and eight ventilators or air distributors, these being found to be the smallest numbers necessary for an apparatus which can have a large output of material.—T. F. B.

VII.—ACIDS, ALKALIS, AND SALTS.

Sodium Hydroxide; Preparation of Pure — for Laboratory Purposes. F. W. Küster. Z. anorg. Chem., 1904, 41, 474–476.

A LARGE glass or porcelain dish, (diameter, say 50 cm.,) with a flat bottom, is filled to a height of a few centimetres with water. In the middle of the dish is placed a shallow wide-necked bottle (crucible) of platinum, silver, or nickel of 500–1000 c.c. capacity, and above this a large funnel, closed below, formed of commercial nickel wire gauze. The funnel is mounted on a tripod, so that its point is a few centimetres above the mouth of the bottle or crucible.

Pieces of bright metallic sodium (several hundred grms.) are placed in the wire funnel, and a large bell jar is placed over funnel and bottle. The bell jar is only slightly less in diameter than the outer dish, and it rests on pieces of glass rod, the water forming a seal. The sodium immediately begins to deliquesce, and the sodium hydroxide formed, drops as a concentrated (about 40 per cent.) oily solution into the bottle. The solution may be preserved in bottles made of pure nickel.—A. S.

Arsenious Acid; Action of — on "freshly-precipitated" Ferric Hydroxide. W. Biltz. Ber., 1904, 37, 3138–3150.

THE fact that freshly-precipitated ferric hydroxide is capable of taking up arsenious acid from its solutions, was discovered in 1834 by Bunsen, who considered this due to the formation of a basic ferric arsenite, $4\text{Fe}_2\text{O}_3 \cdot \text{As}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$. The author prepared a hydrogel of ferric oxide, obtained by precipitating an oxidised boiling solution of ferrous sulphate with ammonia, and washing the precipitate for five days by decantation with hot water. 10 c.c. of this hydrogel (containing about 1.1 gm. of ferric oxide) were then mixed under different conditions with equal volumes (180 c.c.) of aqueous solutions of arsenious acid of different degrees of concentration, and after the action was complete, the amounts of arsenious acid remaining in solution were determined. The results, given in tables and curve-diagrams, can, according to the author, only be satisfactorily explained on the assumption that the fixing of the arsenious acid is an adsorption process. This view also affords an explanation of the great influence of the physical condition of the ferric hydroxide on the amount of arsenious acid taken up. Increase of temperature has little influence on the adsorptive power of the ferric hydroxide, but accelerates the rate at which the arsenious acid is taken up. The author, in conclusion, discusses some bearings of this adsorption process on the action of antitoxins on the toxins of blood serum.—A. S.

Selenium and Tellurium; Use of Phosphorous Acid in the Quantitative Determination of —. A. Gutbier. XXIII., page 1046.

Potassium Acetate; Electrolysis of —. H. Hofer and M. Moest. XI. A., page 1034.

Graphite from Wood Charcoal; Preparation of —. J. Weckbecker. XI. A., page 1034.

Nitrogen; Oxidation of —, by the Electric Flame. F. v. Lepel. XI. A., page 1033.

Carbonic Acid; Reduction of Combined Solid — to Carbon, &c. F. Haber and St. Tolloczka. XI. A., page 1033.

ENGLISH PATENTS.

Barium Oxide; Manufacture of Porous —. H. Schulze, Bernburg, Germany. Eng. Pat. 21,392, Oct. 5, 1903.

See Fr. Pat. 335,677 of 1903; this J., 1904, 253.—T. F. B.

Metal Sulphates or other Salts; Producing — from Metal Sulphides and Sulphide Ores containing Iron. O. Meurer, Cologne, Germany. Eng. Pat. 26,668, Dec. 5, 1903.

See U.S. Pat. 733,590 of 1903; this J., 1903, 908.—T. F. B.

UNITED STATES PATENTS.

[Lime]-Kiln. D. H. Gibson, Seattle, Wash. U.S. Pat. 771,623, Oct. 4, 1904.

A KILN for burning lime has an external annular gas chamber around its lower part, connected with a producer furnace and having adjustable openings or ports into the kiln. A distributor is arranged within the kiln so as to leave an annular space between it and the wall of the kiln. Air is led into the kiln through a central vertical channel in the distributor, having radial ports or openings into the annular space.—W. H. C.

Metals [and Caustic Soda]; [Electrolytic] Process of Obtaining —. F von Kugelgen and H. Danneel. U.S. Pat. 771,646, Oct. 4, 1904. XI. B., page 1035.

FRENCH PATENTS.

Barium and Strontium Hydroxides; Manufacturing — by the aid of their Sulphides. C. M. Joseph, known as C. Limb. Fr. Pat. 338,958, July 30, 1903.

Barium or strontium sulphide solution is treated with the hydroxide of a heavy metal, preferably of zinc. On filtering the boiling solution from the precipitated zinc sulphide, crystals of barium or strontium hydroxide separate from the filtrate on cooling. The heavy metal hydroxide is prepared by adding milk of lime to solution of the chloride, and separating the precipitate. The zinc sulphide (or other metal sulphide) formed in decomposing barium sulphide as described, is dissolved in hydrochloric acid to reconstitute the chloride.—E. S.

Pernanganic Sulphate derived from Manganese Dioxide; Production of a —. Badische Anilin und Soda Fabrik. Fr. Pat. 338,961, July 30, 1903.

See Eng. Pat. 17,981 of 1903; this J., 1904, 749.—T. F. B.

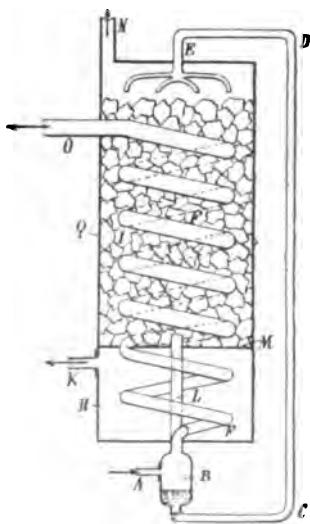
Zinc Oxide; [Electrical] Manufacture of —. C. J. Barbier. Fr. Pat. 338,977, Aug. 12, 1903. XI. A., page 1034.

Oxygenated Water; Preparation of —. Soc. Steinfelner and Co. Fr. Pat. 343,589, June 1, 1904.

The customary process of adding a paste of barium peroxide to a dilute mixture of hydrochloric, phosphoric, and sulphuric acids, is modified by substituting an alkali chloride for the hydrochloric acid.—E. S.

Air; Separation of — into its Constituents. Soc. l'Air Liquide (Soc. p. l'étude et l'exploitation des Procédés G. Claude). Fr. Pat. 338,964, Aug. 1, 1903.

In the apparatus shown (see figure) the column Q is divided by the partition M into the two compartments I and H, which communicate by the overflow pipe L, the bottom of which reaches nearly to the bottom of the compartment H. Distillation and fractionation of the vapours from the liquid air are simultaneously effected in the compartment I, and the liquefied gas which collects at the bottom and overflows through the pipe L into the chamber H, consists of oxygen, more or less pure. In that chamber the oxygen volatilises and passes through the exit K, to a series of temperature-exchangers, and thence to apparatus for utilisation. The liquefying system is represented by the vessel B, into which previously cooled air enters through the inlet A, the adjuncts to which are the liquefying coil F, and the pipe C, D, E, terminating in a sprayer. The air ascending the coil becomes gradually liquefied as it ascends, the liquid formed becoming continuously poorer in oxygen. The liquefied portions trickle downwards into the vessel B, from which they pass through the tube and issue from the spreader, upon fragments of coke or the like, surrounding the coil, with which the chamber is packed, and which ensure even distribution. The nitrogen, in a more or less pure state, resulting from the fractionation of the gases



volatilised from the liquid, escapes through the outlet to the coil O, on its way to the exchangers. Compare Fr. Pats. 296,211 (4th add.), 1904, and 338,842, 1903; this J., 1904, 816 and 823.—F. S.

VIII.—GLASS, POTTERY, ENAMELS.

ENGLISH PATENTS.

Glazes, Enamels, or Bodying Material; Process and Apparatus for Applying — to Bricks, Tiles, or other like Goods. R. Stanley and E. Jeffcote, Nuneaton. Eng. Pat. 25,686, Nov. 24, 1903.

THE process consists in allowing a stream of the glaze, enamel, &c., to flow from an outlet, and spraying the same on to bricks, tiles, and other goods by means of jets of air, steam, or gas. The articles are placed on a travelling belt, and the glaze, &c., is contained in tanks, the outlets of which are near the articles on the belt; the spraying nozzles are arranged close to the outlets. A sloping roof is provided above the belt, and shields along each of its sides, whereby surplus material is collected and returned to troughs.—W. C. H.

FRENCH PATENTS.

Silica Glass; Manufacture of — with Quartz Sand, Silicious Earth, &c. J. Bredel. Fr. Pat. 343,845, June 10, 1904.

QUARTZ sand, silicious earth, &c., is fused at a suitable temperature, and broken into small pieces, which are afterwards heated to 1,000° C., and rapidly plunged into cold water. By this means, it is claimed, the product acquires insensibility to variations of temperature, and the formation of air bubbles during the fusion is avoided.—W. C. H.

Enamels, Coloured Transparent; Process for obtaining in the Cold — on a Metal Foundation. A. Westphal and H. Maillard. Fr. Pat. 343,602, June 1, 1904.

SUBSTANCES which cannot be heated without injury, such as wood, iron, zinc, stone, &c., are first coated with thin metal foil, on which is then poured a mixture of a colouring matter with sodium silicate solution or varnish. After drying, the surface is polished. Two or more colours may be used to give different effects.—A. G. L.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

Lime-Sand Bricks; Effect of Infiltrated Water on —. Thonind. Z., 1904, 28, 1441.

A NUMBER of different kinds of lime-sand bricks were soaked with carbonated water for a month, by luting glass cylinders on to the bricks and filling the former with water saturated with carbon dioxide. To ensure comparable results the bricks were cut in two, one half of each being treated as above, the other left dry. The crushing-strength test gave the following results:—

Dry Bricks.	Soaked Bricks.
Kilos. per Sq. Cm.	Kilos. per Sq. Cm.
187	154
213	194
265	231
313	253

thus indicating the inadvisability of using lime-sand bricks in places where they are liable to infiltration of water charged with carbon dioxide.—C. S.

ENGLISH PATENTS.

Impregnating Wood or other Porous Materials to Protect against Damp, Fungus, or Insects, or for Colouring. W. R. Hodgkinson, London. Eng. Pat. 26,115, Nov. 30, 1903.

THE materials to be treated are placed in a vessel from which gases or liquids may be extracted by a suitable

pump, and any desired vacuum maintained. Impregnating substances, dissolved in suitable volatile solvents, are then admitted into the vessel, and the solutions driven into the pores of the materials by atmospheric pressure, the volatile solvents being finally removed preferably by again exhausting the vessel. Impregnating substances suggested are dyes, waxes, resins or extracts, such as the acetone solution of the waxy and oily constituents of teak wood.—W. C. H.

Works of Art [Imitation Marble] and the like; Process for Manufacturing — H. J. P. Dumas, London. Eng. Pat. 26,568, Dec. 4, 1903.

THE process consists in mixing lime, prepared from white marble, with finely-ground or larger pieces of white or coloured marble, with or without the addition of pigments such as graphite, or metallic oxides, and making the whole into a stiff mass with water, and casting it in moulds. As a binding agent a cement-like body may be used, in which the silica and alumina are replaced by scrap marble ground to fine powder.—W. C. H.

Bricks, Paving Flags, Artificial Stone; Manufacture of Various Articles, such as — S. F. Prest, London. Eng. Pat. 17,968, Aug. 13, 1904.

THE slag from Bessemer converters or Siemens's furnaces is ground or crushed, and the magnetic particles are separated from the non-magnetic. Slaked lime is then added to the latter, the whole is moulded under pressure and then subjected in a closed chamber to the action of steam under pressure. A red colour may be imparted to the grey product by adding hematite iron ore.—A. G. L.

UNITED STATES PATENT.

Bricks; Coating —, and *Apparatus therefor*. M. Perkiewicz, Ludwigsberg, Germany. U.S. Pat. 771,443, Oct. 4, 1904.

SEE Eng. Pat. 3760 of 1904; this J., 1904, 662.—T. F. B.

FRENCH PATENTS.

Marble and Stone, Artificial; Manufacture of — L. Törnø. Fr. Pat. 343,479, March 8, 1904.

THE artificial marble is made by mixing 100 kilos. of finely-ground porcelain waste, twice-burnt clay, lime burnt three times, aluminium silicate, and powdered pebbles, 10 kilos. of marble dust, 1 kilo. of mica, 2 kilos. of gum arabic or other gum, 100 grms. of glue, 300 grms. of agar-agar, 50 grms. of borax, 25 grms. of saponin, and 100 litres of water. Colouring matter may also be added. The whole is allowed to remain in a mould for eight to ten hours, after which it is suspended by threads placed in the mixture for eight days in order to dry. When thoroughly dry, the mass is plunged into a liquid of the following composition, previously heated to 100° C.: 1 kilo. of gum arabic, 100 grms. of glue, 300 grms. of agar-agar, 50 grms. of borax, 25 grms. of saponin, and 100 litres of water. After removing from this solution the mass may be polished.—A. G. L.

Tarring or Asphalting Roads; Product for — and *Process for its Manufacture*. L. Préaubert and G. A. Thubé. Fr. Pat. 342,898, May 5, 1904.

THE product for preventing the formation of dust on roadways, &c., consists of a mixture of a solution of casein, and of bitumen, asphalt, tar, or other bituminous body, previously softened by heat, the mixture being diluted with a suitable quantity of water, with or without the addition of fatty substances, antiseptics, and colouring or decolorising materials. See also Fr. Pat. 331,805 of 1903; this J., 1903, 1260.—W. C. H.

Building Material; Artificial — L. E. Colomiès. Fr. Pat. 343,223, May 17, 1904.

A PRODUCT called "calsibonarite massive" is obtained by mixing 45 parts of river sand or clay, 45 of limestone, 3 of iron or copper sulphate, 3 of salt, 2 of alum, and 2 of

borax, moulding and subjecting the mixture to a temperature of 1100° to 1200° C. After cooling, the mass presents a brilliant and polished surface. Another product called "calsibonarite vitrifiée" is made from 42.5 parts of river sand or clay, 42.5 of limestone, 4 of copper or iron sulphate, 5 of salt, 3 of alum, and 3 of borax. The mixture is fused at 1100° to 1200° C., and used for making paving-stones, facings, &c.—A. G. L.

Cement; Process for Making a Vitreous — which can be used as a Mastic. P. Steenbock. Fr. Pat. 343,860, June 10, 1904.

SEE Eng. Pat. 15,181 of 1904; this J., 1904, 901.—T. F. B.

Substance [Cement] which Hardens under the Action of Phosphoric Acids or their Acid Salts; Process for Making a — P. Steenbock. Fr. Pat. 343,861, June 10, 1904.

SEE Eng. Pat. 15,181 of 1904; this J., 1904, 901.—T. F. B.

X.—METALLURGY.

Acid Open-Hearth Manipulation. A. McWilliam and W. H. Hadfield. Iron and Steel Inst., Oct. 1904.

THE opinion is generally prevalent that to increase the silicon in the metal in the open-hearth furnace an abnormally high temperature is necessary. The authors still uphold their view that, though a high temperature may accelerate the reduction of silica by carbon, the main determinant of the amount of silicon in the steel is the composition of the slag, especially with regard to its acidity. They quote many instances in support of their view, but especially one experiment in which at a certain period they added to the charge 8 cwt. of old red bricks containing 79 per cent. of silica. Though the effect of this was obviously to lower the temperature, yet the silicon in the metal, which had been gradually going down, at once began to rise. Another experiment showed the effect of lime: the slag was allowed to thicken for nearly an hour, when 3½ cwt. of limestone were added; the slag rapidly thinned, but though the percentage of silica in the slag was thus reduced from 5½ to 53½, and that of lime increased from 2 to 6, the silicon in the metal continued (though at a decreasing rate) to increase. Magnesia (3 cwt. of magnesite) in another experiment behaved very similarly; but 4 cwt. of peroxide of manganese, while it thinned the slag and made it less silicious, caused also a rapid drop in the silicon in the metal. The difference in behaviour between oxidising and non-oxidising "bases" is clearly shown by these experiments. In the last experiment the slag afterwards thickened and became much more silicious, at the cost, as was seen after the termination of the experiment, of the bottom of the furnace. Brinell has found (paper read by Wahlberg at May meeting of Iron and Steel Inst.) that, giving aluminium and silicon certain relative values in terms of manganese, calculating all out to manganese and taking the total, a number is obtained which is termed the "density-quotient," such that for the same "density-quotient" the same type of ingot is yielded, and the higher the "density-quotient" the fewer blowholes in the ingot. The authors' general experience agrees with that of Brinell; but they also find that the longer the time given for thickening of the slag, the lower is the "density-quotient" needed for the same type of ingot, or the fewer are the blowholes in ingots of the same "density-quotient"; ingots made (1) by ordinary treatment, (2) by giving 1½ hours' and (3) 2½ hours' thickening, and having "density-quotients" of 1.35, 1.00, and 0.814 respectively, were all three alike as to their freedom from blowholes.

—J. T. D.

Steel; Temperatures of Transformation of — G. Charpy and L. Grenet. Comptes rend., 1904, 139, 567—568.

THE temperatures of transformation of specimens of steel containing varying amounts of carbon were determined (a) by the electric resistance, (b) by the "thermo-electric"

method, (c) by the expansion. The results were as follows:—

Carbon.	Temperature of Transformation.			
	Resistance Method.		Expansion Method.	
	Start.	Finish.	Start.	Finish.
Per Cent.	°C.	°C.	°C.	°C.
0.82	730	760	735	745
1.06	730	760	740	750
1.15	739	739	735	740
1.38	750	750	735	755

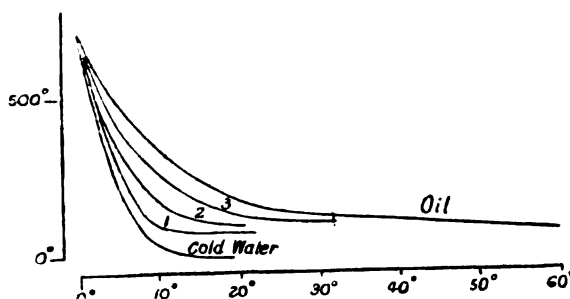
Carbon.	Thermo-electric Method.		Expansion Method.	
	dE dt	dE dt	Start.	Finish.
	Max.	Min.	°C.	°C.
0.28	720	840	720	820
0.62	700	760	743	760
0.93	700	800	737	760
1.14	700	780	747	760
1.30	680	740	725	740

It thus appears that the resistance method and the expansion method give fairly concordant results, but the results obtained by the "thermo-electric" method do not agree well, except in the case of very low carbon steels.

—T. F. B.

Steel; Studies on the Quenching of—H. Le Chatelier. Bull. Soc. Encourag., 1904, 106, Rev. Metall., 473—491.

THE author determined the rate of cooling of test pieces of iron and steel in different liquids. The length of time occupied in cooling from 700° to 100° C. by a piece of iron or steel 18 mm. long and 18 mm. diam. quenched at 900° C. in a large volume of water, was found to be 6—8 seconds. The cooling proceeds at the same rate in different aqueous solutions, e.g., solutions of sodium chloride, sulphuric acid, and sodium carbonate, as in pure water. Agitation of the cooling liquid has no notable influence on the rate of cooling, but is advantageous in that the metal is cooled uniformly. By raising the temperature of the water used for quenching, the rate of cooling is retarded, the retardation being greater the nearer the temperature of the water approaches 100° C. The rate of cooling is much slower when the quenching is effected in metal baths (mercury, molten lead, &c.), showing that the conductivity of the quenching liquid is of less importance than its specific heat. Quenching in fresh colza oil gives about the same results as quenching in boiling water, but with oil which has been used several times, and which has thickened,



the rate of cooling is slower. By varying the amount of water all the intermediate stages between quenching in a large quantity of cold water and quenching in oil can be attained by quenching in water. Perhaps the best results would be obtained by using a quantity of water (or preferably an aqueous solution of calcium chloride boiling at 150° C.) equal to or twice that of the piece of metal. The

curve given, shows the rate of cooling of a piece of metal from 700° C. when quenched respectively in a large quantity of cold water; in three times its weight of water (1) (see figure), twice its weight of water (2), $1\frac{1}{2}$ times its weight of water (3), and in oil.—A. S.

Molybdenum Steels. L. Guillet. Comptes rend., 1904, 139, 540—542.

LIKE the tungsten steels (this J., 1904, 668) these steels are divisible into two classes—those showing a perlite structure (below 2 per cent. of molybdenum when the carbon is 0.2 per cent., below 1 per cent. of molybdenum when the carbon is 0.8 per cent.), and those containing a double carbide (with more molybdenum than 2 or 1 per cent. as the carbon is 0.2 or 0.8 per cent.). The latter constituent appears as extremely fine white filaments, left white by picric acid, but blackened by alkaline sodium picrate. The effect of molybdenum even in small quantity is greatly to increase the breaking stress without rendering the metal brittle. In the case of the perlite steels, the breaking stress and elastic limit rise with increase of molybdenum; the elongation is fair, the reduction of area good, the resistance to shock high, and the hardness medium. The carbide steels have very high breaking stress and elastic limit, and are extremely hard, but they are very brittle. Their behaviour under tempering and annealing is similar to that of tungsten steels. Indeed, the effect of molybdenum is in general similar to that of tungsten, but a much smaller amount of molybdenum than of tungsten is needed to produce the same result. Bearing this in mind, molybdenum steels are probably not more expensive than tungsten steels, and may frequently, the author thinks, be substituted for them with advantage.—J. T. D.

Tin Steels. L. Guillet. Bull. Soc. d'Encourag., 1904, 106, Rev. Metall., 499—503.

THE author examined two series of tin steels with from 1.79 to 9.98 per cent. of tin containing:—(1) 0.100 to 0.204 per cent. of carbon; and (2) 0.665 to 0.767 per cent. of carbon. The results showed that tin makes the steel very hard and brittle. The tin dissolves in the iron and appears to form a compound with it. In tin steels containing not more than 10 per cent. of tin all the carbon is in the form of pearlite. Tin steels thus resemble titanium steels (see following abstract) more closely than they do silicon steels, in that the whole of the carbon contained in them occurs in the form of iron carbide.—A. S.

Titanium Steels. L. Guillet. Bull. Soc. d'Encourag., 1904, 106, Rev. Metall., 506—510.

TWO series of steels were examined, containing:—(1) from 0.112 to 0.137 per cent. of carbon and from 0.415 to 2.57 per cent. of titanium, and (2) from 0.611 to 0.760 per cent. of carbon and from 0.325 to 8.71 per cent. of titanium. The results of both the micrographic examination and of mechanical tests of the alloys shows that titanium has practically no influence on the properties of carbon steels.—A. S.

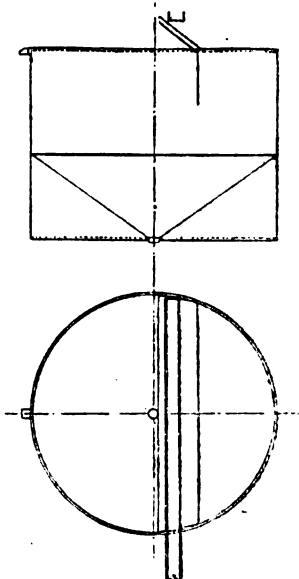
Gold Ore; Regrinding of—for Cyaniding, &c. C. Butters and E. M. Hamilton. Inst. of Min. and Met., Oct. 20, 1904.

MANY ores which have proved very refractory under other methods of treatment will yield excellent results by the cyanide process when reduced to a very fine state of division. The best method of effecting this seems to be to stamp through a screen of 30 to 35 mesh and then regrind the coarser particles in a tube-mill or some similar machine. The grade of sand to be reground should be all that will not pass a 200-mesh screen. When No. 35 screens were in use at the El Oro mill, Mexico, this amounted to 51 per cent. of the pulp issuing from the mortar boxes. The regrinding resulted in about 50 per cent. of the total ore in the battery bins being rendered capable of treatment by agitation, the remainder leaching freely; the extra recovery of gold and silver amounted to about 16s. 6d. per ton of sand reground and an extra profit of 14s. 4½d. With a view of recovering more of the silver, many tests were made on the

slimes, such as mechanical agitation of the solution, addition of potassium permanganate, addition of mercuric chloride, roasting the dried slime, &c. On the whole, the use of mercuric chloride seems to give the best results at the least cost. The only drawback to its use is the possible effect it may have on the steel tanks and iron piping.—J. H. C.

Slimes [Gold] Treatment; Impts. in —. M. Torrente. J. Chem., Metall. and Mining Soc., S. Africa, 1904, 5, 46—49.

THE improvements relate to the settling and separation of the slime from the washing solutions, after extraction of the gold. The separator consists of a tank (see figure) with a conical bottom. A vertical partition extends downwards to about two-thirds of the depth of the cylindrical portion of the tank, whilst above the tank it is connected to an inclined plane. A number of these tanks are connected together. They are filled with water or cyanide solution, and the slime-pulp is delivered slowly on to the inclined plane above the first tank of the series. The solid matter passes down into the conical bottom, where it is run off, mixed with water or cyanide solution, and passed through the second separator, and so on. The clear solution containing the dissolved gold, runs off at the top of the tank and passes to the precipitating boxes. Figures are given showing the satisfactory results which are obtainable by this method of treatment.—A. S.



"White Precipitate" of the Precipitating Boxes in Cyanide Works. A. Prister. J. Chem., Metall. and Mining Soc., S. Africa, 1904, 5, 62—63.

THE author gives the following analyses of "a medium solution" before and after passing through the zinc precipitating box, and claims that the results confirm his view that the "white precipitate" consists mainly of zinc ferrocyanide and not of zinc oxide.

	Before contact with Zinc.	After passing through the Zinc Box.
Oxygen	0.61	0.49 per cent. by volume.
Nitrogen	1.84	1.56 "
Potassium ferrocyanide	0.147	0.0276 per cent. "
Thiocyanate	0.0232	0.0247 "
Alkalinity	0.23	0.254 "
Potassium cyanide	0.110	0.045 "

It appears therefore that over 81 per cent. of the ferrocyanide present in the original solution remained in the zinc box "in the form of white precipitate"; the reduction in the amount of potassium cyanide would also favour the precipitation of zinc ferrocyanide. The increase in the alkalinity of the solution would be unfavourable to the separation of zinc oxide, which is soluble in alkalis.—A. S.

Copper in Potassium Cyanide; Examination of Solutions of —. F. Kunschert. XI., page 1034.

Chromium and Iron [in Ores and Alloys]; Volumetric Determination of —. R. Glasmann. XXIII., page 1046.

ENGLISH PATENTS.

Iron Ore or Iron Wastes or Natural Iron Sands; Converting Powdered — into Briquettes or Lumps. T. Rouse and H. Cohn, London. Eng. Pat. 25,248, Nov. 19, 1903.

POWDERED iron ore, iron waste, or natural iron sand is wetted with a weak solution of alum, and moulded into briquettes or lumps, which, if intended for transport, may be hardened by heating them to about 700° C.—E. S.

Manganese Steel; Manufacture of —. R. A. Hadfield, Sheffield. Eng. Pat. 25,794, Nov. 26, 1903.

AN alloy of manganese and iron containing from 70 to 90 per cent. of manganese and less than 3 per cent. of carbon, such as is produced in the electric furnace, is added, preferably in a molten condition, to molten decarburised iron in lieu of the ferro-manganese ordinarily used. In this way it is possible to produce a low-carbon manganese steel which is much less liable to fracture than that heretofore produced.—J. H. C.

Gold Ores; Extraction of Gold from —. J. W. Worsey and E. Hoal, St. Helens, Lancs. Eng. Pat. 14,398, June 29, 1903.

TO the powdered ore, freed as much as possible from aluminous silicates, chlorates and bromides of alkalis or alkaline earths are added together with acid, whereby nascent "bromide of chlorine" is produced, which, after the temperature of the mass has been raised to the boiling point, is stated to dissolve the gold. The gold solution is separated by decantation and leaching, a lead salt is added, then sulphuretted hydrogen, and finally air is blown through, thus precipitating the gold and lead as sulphides which may be reduced in any known way. Any gold remaining in the residues may be dissolved out with a weak solution of "double or single ferro-prussiate of ammonium and soda or potash."—J. H. C.

Magnetic Separators for Ores, &c. J. T. Dawes, Prestatyn, Wales. Eng. Pat. 21,324, Oct. 5, 1903.

THE ore to be treated, is finely powdered and fed upon open-ended rotatable non-magnetic drums having surfaces sufficiently rough to carry the ore beneath rotating non-magnetic discs. By means of electro-magnets placed within the drums and above the discs, strong magnetic fields are produced passing through the discs and drums. By the rotation of the drums, the ore is carried forward through these fields, the magnetisable particles being attracted to the lower surfaces of the discs and carried out of the fields, when they fall into hoppers, the non-magnetisable particles remaining upon the drums until they too are carried through the fields and fall into hoppers.—J. H. C.

Magnetic Separators for Ores or like Materials. J. M. Moss, Heaton Chapel, Lancashire. Eng. Pat. 23,333, Oct. 28, 1903.

THE powdered ore is fed from a hopper upon an endless travelling belt, which is supported on pulleys to pass below, and in contact with, a polygonal drum, provided with electro-magnets, and having projections or anti-friction rollers at the junctions of the faces, so arranged as to depress a portion of the belt as the drum revolves. There is also a movable roller to maintain the tension on the belt.—E. S.

Fused Metals and Alloys; Process and Apparatus for Granulating or Pulverising —. L. Fink-Huguenot, Paris. Eng. Pat. 16,449, July 25, 1904. Under Internat. Conv., Jan. 7, 1904.

METALS or alloys which fuse below 1,472° F. are fed, in a molten condition, into the upper part of a vertical closed cylindrical vessel. The fused metal flows out through a horizontal side-passage near the bottom of the vessel and is ejected, by means of gas or steam under pressure, into a truncated cone in the form of spray. The spray passes through a central opening in the truncated cone, and is collected in a suitable receptacle in the form of a metallic

powder. The excess of gas or steam which does not escape through the discharge opening of the cone, returns through pipes to the top of the closed cylindrical vessel.

—A. S.

UNITED STATES PATENTS.

Steel Alloy. C. E. Manby, Carnegie, Pa. U.S. Pat. 771,559, Oct. 4, 1904.

CLAIMS are made for steel containing nickel and ferrovanadium; or ferrovanadium, nickel, and ferromanganese; and for a steel alloy composed of iron, carbon, nickel, manganese, and ferrovanadium.—E. S.

Metals or Alloys; Method of Decarbonising — F. von Kügelgen and G. O. Seward, Holcombe Rock, Va., Assignors to the Willson Aluminium Co., New York. U.S. Pat. 771,645, Oct. 4, 1904.

THE ore is smelted under such conditions as to give a maximum yield of metal, independent of the proportion of carbon introduced or present, and the molten product is then decarburised by bringing it "into contact with calcium."—E. S.

Steel; Furnace for the Manufacture of — G. Gin, Paris. U.S. Pat. 771,872, Oct. 11, 1904.

SEE Fr. Pat. 342,101 of 1904; this J., 1904, 904.—T. F. B.

Iron; Process of Dechromising — O. Massenez, Wiesbaden, Germany. U.S. Pat. 772,164, Oct. 11, 1904.

SEE addition, dated July 1, 1903, to Fr. Pat. 329,132 of 1903; this J., 1903, 1353.—T. F. B.

Gold; Apparatus for Extracting — from Auriferous Sand, &c. R. Blake, Assignor to Eliza Blake, Madison, N.J. U.S. Pat. 771,454, Oct. 4, 1904.

In an amalgamating tank a horizontal revolving cylinder is set transversely to the feed of ore, its lower part being immersed in mercury. Circular guards are secured to the inner sides of the tank, each having an annular horizontal flange overhanging, and closely embracing, the contiguous end portion of the cylinder. A revolving wiper is provided for dislodging the material carried upon the cylinder. A pivotally suspended arm depends within the upper portion of the tank, between the cylinder and the discharge aperture, and is provided with several alternating series of teeth extending transversely across the tank. Means are provided for oscillating the arm, so that the teeth move backward and forward in the path of an arc above the surface of the mercury.—E. S.

Ores; Process of Concentrating — Alice H. Schwarz, New York, Assignor to Schwarz Ore Treating Co., of Arizona. U.S. Pat. 771,277, Oct. 4, 1904.

PARAFFIN or some fatty substance which is solid at the ordinary temperature, is melted, and mixed with the powdered ore in a vessel provided with a mechanical agitator, and with means for introducing and discharging fluids. Cold water is introduced during agitation of the charge, and separation is effected between the valuable constituents entrained by the fatty matter and the gangue. The fatty matter is then liquefied to obtain the "values." —E. S.

FRENCH PATENTS.

Cast-Iron; Process and Installation of Furnaces for the Production of — by Reduction and Fusion of the Ores in Separate Furnaces. Georges-Marien-Bergwerks und Hütten-Ver. Akt.-Ges. Fr. Pat. 343,548, May 30, 1904.

A BLAST furnace in which previously reduced iron ore is smelted with coke and lime, and is provided with an exit conduit for the gases (chiefly carbon monoxide) at about the upper limit of the zone of fusion. This conduit leads to near the bottom of one or more cupola furnaces in which the raw ore is reduced solely by the action of the reducing gases.—E. S.

Iron; Manufacture of — E. Fleischer. Fr. Pat. 343,701, June 4, 1904.

THE finely-powdered iron ore, mixed with any required flux, is delivered into the upper end of an inclined rotating cylinder, the lower end of which is adapted to a second rotating cylinder, placed at a greater inclination than the first. The ore descending the first cylinder is met by a strongly reducing flame of relatively low temperature, issuing from the junction of the two cylinders, and the reduced and spongy iron produced, is fused in the second cylinder by encountering there a flame of high temperature, but of neutral or feeble reducing effect. In another form of the apparatus, a single rotating cylinder is used, having operating within it a specially devised burner for giving the reducing flame, whilst the hotter flame meets the ore at the end.—E. S.

Copper, Zinc, Cadmium, Silver, Nickel, Cobalt, and Tungsten; Obtaining Hydroxides of —, in the Wet Way, by Direct Extraction. D. Lance. Fr. Pat. 342,865, May 4, 1904.

A "MASSIVE" filter press, in which the usual intermediate plates are replaced by a cylinder, is used in obtaining saturated solutions from finely-powdered ores of the metals named in the title, the solution being aided by the presence of ammonia or an amine, or a mixture of these. Simple or complex silicate ores are prepared for the specified treatment by a previous attack with a strong acid. From the solutions obtained, the hydroxides are fractionally precipitated by the aid of heat, assisted or not by a vacuum, the precipitation occurring in the following order:—zinc, cadmium, cobalt, nickel, copper, silver. The ammoniacal saline combinations of the dissolved metals are, when required, decomposed by the use of baryta or lime, in case it is required to fix sulphuric acid; or if it be required to retain carbon dioxide in combination, calcined dolomite may be used.—E. S.

Ores; Process and Apparatus for the Treatment of — J. E. Goldschmid. Fr. Pat. 343,313, May 19, 1904.

POWDERED iron ore is charged from a hopper into one end of a horizontal revolving cylinder, into the opposite end of which a pipe passes conveying water-gas. Within the gas-pipe, and reaching beyond its end (at which the gas is ignited) is a tube conveying air to support combustion. The ore is successively dried, oxidised, and reduced, as it travels towards the flame at the exit end. A U-tube for passage of gaseous products is adapted to one end of the cylinder, in which tube condensation of vapours is effected by water spray. The apparatus is specially adapted for the preliminary treatment of pyrites cinders, &c., but is also available generally in treating matters which, owing to being pulverulent, are otherwise difficult to treat. Such matters are the residual products of the aniline manufacturer, or the residues of the treatment of copper ores.—E. S.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(A.)—ELECTRO-CHEMISTRY.

Zinc Salts; Study of Complex — F. Kunschert. Z. anorg. Chem., 1904, 41, 337–358.

THE author investigated the condition of zinc in solutions of its complex salts, by electro-chemical means and by solubility determinations.

Zinc in Alkali Oxalate Solutions.—In concentrated solutions of zinc oxalate in ammonium and potassium oxalates, the zinc is in the form of the complex ions $\text{Zn}(\text{C}_2\text{O}_4)_3^{4-}$, but on dilution, the latter split up, in part, into $\text{Zn}(\text{C}_2\text{O}_4)_2^{2-}$ and free oxalate ions. A somewhat higher E.M.F. is required to separate zinc from alkali oxalate solutions, than from solutions of its sulphate, but the deposit obtained from the oxalate solutions is more adherent. Further, in the electrolysis of sulphate solutions, sulphuric acid is set free, and thus the concentration of the hydrogen ions becomes greater and the discharge potential of the

same less, so that the proportion of the current energy consumed in the evolution of hydrogen increases continuously. In the electrolysis of oxalate solutions, on the other hand, whilst the tendency to the evolution of hydrogen is greater at first than in the sulphate solutions, it remains nearly constant throughout the course of the electrolysis.

Zinc in Sodium Hydroxide Solutions.—The zinc exists chiefly in the form of ZnO_2^{2-} ions, which, however, are hydrolysed, in part, to HZnO_2^- and hydroxyl ions. Both the compounds, Na_2ZnO_2 and NaHZnO_2 , are stable only in the presence of excess of sodium hydroxide. In electrolysis with insoluble anodes, the E.M.F. required for the separation of zinc is 1.488 volts from N/1-alkali solution, and 1.528 volts from a neutral solution. In general, the employment of neutral solutions gives the more satisfactory results.

Zinc in Potassium Cyanide Solutions.—The zinc exists partly in the form of Zn(CN)_4^{4-} ions and partly in the form of Zn(CN)_3^- ions. In a solution of zinc in potassium cyanide, according to the concentration, from 10 to 20 per cent. of the salt $\text{K}_2\text{Zn(CN)}_4$ is decomposed into potassium cyanide and the salt KZn(CN)_3 . If the potassium cyanide produced be fixed, e.g., by addition of silver nitrate, the decomposition proceeds further, until finally the whole of the double salt is decomposed, according to the equation: $\text{K}_2\text{Zn(CN)}_4 + 2\text{AgNO}_3 = 2\text{KAg(CN)}_2 + \text{Zn(NO}_3)_2$. The total cyanogen in the zinc double cyanide can thus be determined by titration with silver nitrate solution, and the statement of Bettel (Chem. News, 1895, 72, 286 and 298) that in the titration of cyanide solutions containing zinc, only 7.9 per cent. of the cyanogen in the zinc double salt reacts with the silver nitrate, is incorrect. In the titration of strong solutions, indeed, a turbidity is produced before the whole of the theoretical quantity of silver nitrate solution has been added, but this turbidity consists not of silver cyanide, but of zinc cyanide, and its formation can be prevented by strongly diluting the cyanide solution before titrating. The formation of free potassium cyanide in solutions of the zinc double salt also accounts for the solvent action of such solutions on gold, and explains the possibility of regenerating the potassium cyanide by soluble sulphides. The potassium cyanide cannot, on the other hand, be regenerated by addition of alkali, since the ionic concentration of the zinc is greater in alkaline than in cyanide solutions; indeed, zinc in alkaline solution can be converted into the zinc double cyanide by addition of potassium cyanide. Zinc dissolves, with evolution of hydrogen, in potassium cyanide solutions of strengths such as are used in gold extraction. The rate of solution is accelerated by the presence of foreign metals such as platinum and gold, and by excess of oxygen.—A. S.

Nitrogen; Oxidation of — by the Electric Flame.
F. v. Lepel. Ber., 1904, 37, 3470—3474. (See also this J., 1904, 376.)

In the course of some experiments in which currents of high potential were conducted by the aid of a rotating distributor simultaneously through several discharge-tubes, it was observed that, e.g., with a current of about 6 amperes and 14 volts, the yield of acid (nitrogen oxide) from each of two discharge-tubes arranged in parallel, with fixed electrodes, was approximately the same as from one tube by itself. With this arrangement, however, strong sparking was observed, indicating loss of energy, when the rotating distributor was passing over from one cathodic conducting wire to the other. Experiments were then made in which division of the electric flame was effected in a single discharge-tube by the use of a fork-shaped anode, the points of which could be made to rapidly rotate on the broad cathode plate. With a large apparatus of this form (capacity, 60 litres), and a current of air of 1800—2000 c.c. per minute, a yield of 2.419 grms. of acid was obtained in seven hours by using a current of 12 amperes and 70 volts. With two such apparatus, however, and using a rotating distributor, the yields were relatively much smaller; for example, with a current of 12 amperes and 65 volts the yield of acid was 2.4 grms. per hour from one tube alone, and 1.5 grms. from the other tube alone, whilst from the two tubes

together the maximum yield was 1.5 grms. per hour. The cause of the relatively small yield in the large apparatus in comparison with the yield obtained in the preliminary experiments with a small apparatus with divided current is to be explained by the need of determining with each different size of apparatus, the most suitable values for (1) the amount of electric energy; (2) amount of air; (3) rate of rotation of anode. The experiments, however, show that rotation of the anode and division of the electric flame are advantageous.—A. S.

Carbonic Acid; Reduction of Combined Solid — to Carbon, and Electro-Chemical Reactions with Solid Substances. F. Haber and St. Tolloczko. Z. anorg. Chem., 1904, 41, 407—441.

THE authors have investigated the electrolysis of solid substances at temperatures below their melting points.

Electrolysis of Solid Caustic Soda.—Metallic sodium was produced by the electrolysis of caustic soda below its melting point, with a current-yield of from 39 to 46 per cent., but this was not a true case of electrolysis of a solid compound, since it could be proved that in the electrolyte small paste particles were present, which would of course act as conductors for the current.

Reduction of Combined Carbonic Acid to Carbon.—Experiments were made with mixtures of barium chloride and carbonate, the electrolyte being contained in a nickel crucible which served as anode; the cathode was of iron, platinum, or artificial graphite. The crucible was heated in a Hempel's gas furnace or in an electric furnace. The theoretical current-yield of carbon was obtained. The formation of the carbon is due to the action of the barium set free at the cathode on the barium carbonate.

Reactions between Chlorides and Flue Gases.—In an attempt to electrolyse pure solid barium chloride in a nickel crucible heated in a Hempel's gas furnace, the separation of carbon in amount equivalent to 34 per cent. of the theoretical current-yield was effected. This was found to be due to the formation of barium carbonate from the barium chloride by the action of the products of combustion of the gas, according to the equation: $\text{BaCl}_2 + \text{CO}_2 + \text{O} = \text{BaCO}_3 + \text{Cl}_2$. Experiments showed that calcium chloride and sodium chloride are acted upon in a similar manner. The following are some of the results obtained by heating the substances named in a Hempel's gas furnace:—

Substance.	Time.	Temperature.	Percentage of Chloride converted into Carbonate.
	Mins.	° C.	
6.935 grms. of calcium chloride.	55	780	8.23
10.2215 grms. of barium chloride	55	1000	3.06
12.283 grms. of sodium chloride.	40	900	0.184

In the attempt to electrolyse barium chloride, a small amount of barium sulphate was formed in a similar manner by the action of the sulphur dioxide or trioxide in the products of combustion of the gas.

Electrolysis of Pure Barium Chloride.—Quantitative current-yields of barium subchloride were obtained by electrolysis of pure barium chloride at a temperature below its melting point, in a nickel crucible heated in an electric furnace. Metallic barium is first separated, and this reacts with the barium chloride, forming the subchloride.

Solid Daniel Cells.—Two solid Daniel cells were prepared. In the one, some lead chloride was fused in a U-tube of refractory glass and then allowed to solidify. In one limb of the tube a layer of molten lead was introduced above the lead chloride and a rod of lead inserted in the fused metal to serve as electrode. In the other limb was inserted a silver wire, which carried on its end a lump of silver chloride (prepared by repeatedly dipping the wire in fused silver chloride). This limb was then heated with a small flame until the silver chloride and lead chloride were in good contact. In the second cell, cuprous chloride and copper were substituted for the lead chloride and lead. The E.M.F. of each of these cells was quite measurable, and

corresponded well with the value calculated according to Thomson's law.—A. S.

Graphite from Wood Charcoal; Preparation of —. J. Weckbecker. *Metallurgie*, 1904, 1, 137—142. *Z. Elektrochem.*, 1904, 10, 837.

Rods formed from a mixture of charcoal and alumina, in different proportions, were inserted as a resistance between massive carbon electrodes. By passage of the electric current they were brought to a sufficiently high temperature to dissociate the aluminium carbide, which is first formed, and to volatilise practically all the aluminium. The amount of graphite in the rod was determined by decomposing the amorphous carbon with fuming nitric acid. When the heating was carried out at 2000°—2400° C., a mixture containing 5 per cent. of alumina gave 68 per cent. of graphite, a mixture containing 30 per cent. of alumina, 97 per cent. of graphite. Furnaces are described for the continuous treatment of the mixture with production of graphite. The power required in these furnaces was 19 k.w. hours per kilo. of graphite.—R. S. H.

Potassium Acetate; Electrolysis of —. H. Hofer and M. Moest. *Z. Elektrochem.*, 1904, 10, 833—834.

THE authors offer some criticism of the recent paper by F. Foerster and A. Piquet (see this J., 1904, 940), and point out that methyl alcohol is a very important secondary product in the electrolysis of potassium acetate. The view that the various products of electrolysis are due to the mutual reaction of the separating anions is preferred to that ascribing them to anodic oxidation of acetic acid.

—R. S. H.

ENGLISH PATENTS.

Insulating Material for Electric Conductors. British Thomson-Houston Co., London. From General Electric Co., Schenectady, U.S.A. Eng. Pat. 23,853, Nov. 26, 1903.

THE insulating material is formed by firing together a mixture of ground soapstone, a refractory substance such as clay, and cryolite or other fluxing agent which melts at a sufficiently low temperature to leave the soapstone in a soft condition, so that it may be drilled or machined.—R. S. H.

Peroxides of Magnesium and Zinc; Process for the Electrolytic Manufacture of —. F. Hinz, Berlin. Eng. Pat. 24,806, Nov. 14, 1903.

SEE Fr. Pat. 337,285 of 1903; this J., 1904, 549.—T. F. B.

Copper Sulphate and Caustic Alkalies; Process and Apparatus for the Manufacture of — by the Electrolysis of Alkaline Chlorides. H. M. Granier, Villemonble, France. Eng. Pat. 4487, Feb. 23, 1904. Under Internat. Conv., April 6, 1903.

SEE Fr. Pat. 330,963 of 1903; this J., 1903, 1086.—T. F. B.

Gases and Vapours; Production of Chemical Reactions in — by Electric Discharges. A. de Montlaur, Paris. Eng. Pat. 12,541, June 2, 1904. Under Internat. Conv., June 3, 1903.

SEE Fr. Pat. 332,744 of 1903; this J., 1903, 1298.—T. F. B.

UNITED STATES PATENTS.

Electric Heating; Apparatus for —. [Carbide Production.] W. S. Horry, Assignor to Union Carbide Co., Niagara Falls, N.Y. U.S. Pat. 771,249, Oct. 4, 1904.

THE electric furnace described is arranged so that terminals connected to a source of polyphase current are placed in contact with a conducting body. Different phases of the current are caused to flow along paths which converge to a common point within the body, which thus becomes heated up to any required temperature. The conducting material may consist of a mixture of "a compound and a reducing agent" or of carbide-forming materials. Means are provided for tapping off the product. (See this J., 1904, 548.)

—R. S. H.

Electric Heating; Apparatus for —. [Carbide Production.] W. S. Horry, Assignor to Union Carbide Co., Niagara Falls, N.Y. U.S. Pat. 771,250, Oct. 4, 1904.

As in the furnace described in the preceding abstract, polyphase currents are employed, but the connections are so arranged that the current flows along paths which cross each other through the material to be heated. (See this J., 1904, 548.)—R. S. H.

Peat; [Electrical] Apparatus for, and Process of Removing Water from —. B. Kittler, Memel, Germany. U.S. Pat. 772,717 and 772,891, Oct. 18, 1904.

SEE Eng. Pat. 126 of 1904; this J., 1904, 326.—T. F. B.

FRENCH PATENTS.

Zinc Oxide; Manufacturing [Electrical] —. C. J. Barbier. Fr. Pat. 338,977, Aug. 12, 1903.

PLATES of carbon and of zinc are suspended alternately side by side in a bath of pure water. The plates are sufficiently apart to permit the free falling down of the zinc oxide which forms on the zinc plates when these are connected to the positive pole of a source of electricity, the carbon plates being connected to the negative pole. The oxide as it falls may be caught in a screen suitably supported for agitation; or the process may be made continuous by withdrawing the water charged with zinc oxide to a filter as fresh water flows into the bath.—E. S.

Electric Resistance Materials; Manufacture of —. Chemisch-Elektrische Fabrik "Prometheus." Fr. Pat. 343,731, June 6, 1904.

THE resistance bodies are formed from carbides of silicon or boron, or from other suitable material, by transforming the finely-divided material into a coherent mass by heating it to a temperature below its melting point. One method of carrying this out is to add boric acid to the finely-pulverised carbide, to strongly compress the mixture, and then to bake it at about 1500° C.—R. S. H.

(B.)—ELECTRO-METALLURGY.

Nickel Matte; Electrolytic Treatment of —. E. Günther. *Metallurgie*, 1904, 1, 77—81. *Z. Elektrochem.*, 1904, 10, 836—837.

THE author has been successful in the direct electrolytic treatment of a nickel matte low in copper. The solution of the material at the anode was satisfactory. Using slightly-acid nickel sulphate as electrolyte, at first 92 per cent. of the current efficiency was attained, which, only much later, fell to 80 per cent. At the cathode, nickel of 99.27 per cent. purity was deposited in an excellent form.—R. S. H.

Copper in Potassium Cyanide; Examination of Solutions of —. F. Kunschert. *Z. anorg. Chem.*, 1904, 41, 359—376.

THE author finds by electro-chemical methods that in potassium cyanide solutions the copper exists in the form of $\text{Cu}(\text{CN})_4^{4-}$ ions, and to a lesser extent, of $\text{Cu}(\text{CN})_3^{3-}$ ions. The results of the author's experiments afford an explanation of the necessity of using a somewhat high current-density in electrolytic brass-plating. With a very small current-density and a potassium cyanide solution of moderate strength, the copper, in consequence of its lower discharge potential, separates before the zinc. With a higher current-density the separation of brass takes place, the discharge potential of the zinc being so reduced that the metal becomes capable of forming compounds and solid solutions with the copper. The concentration of cuprous ions in a potassium cyanide solution is very small, and this accounts for the difficulty of precipitating cuprous sulphide from such solutions by hydrogen sulphide. Since if the concentration of the cyanogen ions were increased tenfold, the concentration of the cuprous ions would be diminished to $\frac{1}{10}$ of its original value, the non-precipitation of cuprous sulphide by hydrogen sulphide in presence of a small excess of potassium cyanide is explicable, without assuming the

formation of any particular complex ions (see Treadwell and Girsfeld, this J., 1904, 61). The fact that precipitation may occur on diluting the cyanide solution can be explained by means of the law of mass action, since in the reaction $2\text{Cu}(\text{CN})_2 + \text{H}_2\text{S} = \text{Cu}_2\text{S} + 2\text{HCN} + 6(\text{CN})^-$, eight dissolved molecules or ions are formed from three, and a reaction by which the osmotic pressure is increased is always favoured by dilution.—A. S.

ENGLISH PATENTS.

Sodium and Potassium; Production of — T. Parker, Wolverhampton. Eng. Pat. 19,196, Sept. 7, 1903.

ALUMINATE of soda or potash is mixed with carbon in suitable proportions, and calcined in an electric furnace, whereby the alkali metals are volatilised, and alumina remains behind. Similarly, the alkali silicates can be employed, and carbide of silicon (carborundum) obtained as a secondary product. The same processes can be employed, if nitrogen is introduced, for the production of cyanides.—B. S. H.

Electric Furnaces. E. Ruhstrat and W. E. Grimmer, Göttingen, Germany. Eng. Pat. 24,472, Nov. 18, 1903.

THE furnaces described are of cylindrical or other shape, and are characterised by having a helix of carbon which serves as the heating resistance. The helix may be cut out from a solid carbon article, and the spirals of the helix may be separated by porous carbon having a very high resistance, which serves to strengthen them. Applications of the furnaces to the fusion of refractory materials are described.

—E. S. H.

Electric Furnaces, and Extraction of Zinc by means of same. A. Edelmann and N. Wallin, Charlottenburg, Germany. Eng. Pat. 16,205, July 21, 1904. Under Internat. Conv., July 28, 1903.

THE electric furnace comprises a vertical bell-shaped upper electrode and an annular lower electrode, with a central cavity in which is situated a condensing tube, connecting with condensing chambers. The shaft for the raw material surrounds the upper electrode. In the application to the extraction of zinc, the carbonic oxide and zinc vapours formed by the decomposition of the ore are prevented from escaping directly into the air by the charge filling the shaft. They consequently pass under and into the bell-shaped electrode, which serves as a heat interchanger and pressure equaliser, thence through the condensing tube to the chambers where the zinc is collected, and finally, through a shaft filled with coke, into the air.—R. S. H.

UNITED STATES PATENTS.

Furnace; Electric — H. Harmet, St. Etienne, France. U.S. Pat. 772,354, Oct. 18, 1904.

SEE Fr. Pat. 316,283 of 1902; this J., 1902, 1459.—T. E. B.

Metals; [Electrolytic] Process of Obtaining — F. von Kugelgen, Holcombe Rock, Va., and H. Danneel, Breslau, Germany, Assignors to the Willson Aluminium Co., New York. U.S. Pat. 771,646, Oct. 4, 1904.

A METALLIC oxide is introduced into the cathode chamber of an electrolytic cell, in which the electrolyte is a solution of a haloid compound of an alkali metal. The oxide is reduced to metal, and alkali hydroxide is formed and is withdrawn from the cathode chamber. The strength of the electrolyte is maintained by additions of the haloid salt to the anode chamber. The process is applied to obtain metallic tin, sodium hydroxide and chlorine, from tin oxide and sodium chloride.—E. S.

FRENCH PATENTS.

Electric Induction Furnace with Air-Blast. A. Fauchon-Villeplée. Fr. Pat. 338,985, Aug. 14, 1903.

AN induction furnace is combined with arrangements for blowing air into the charge which is being heated in the furnace.—B. S. H.

Copper Matte in the Electric Furnace; Process for Treating — A. Fauchon-Villeplée. Fr. Pat. 338,986, Aug. 14, 1903.

COPPER matte is treated in a furnace of the type described in the above specification; by means of the air-blast the sulphur and iron are oxidised.—B. S. H.

Steel-making in the Electric Furnace; Process of — A. Fauchon-Villeplée. Fr. Pat. 338,987, Aug. 14, 1903.

MOLTEN cast iron is run into a furnace of the type mentioned in specification 338,985 above. By means of the induced currents the metal is heated, whilst the air-blast oxidises the carbon and other impurities.—R. S. H.

XII.—FATTY OILS, FATS, WAXES, AND SOAP.

Olive-kernel Oil; Influence of — on Olive Oil. N. Passerini. Staz. Sperim. Agrar. Ital., 1904, 37, 600—610.

IN order to test the accuracy of the widespread opinion that olive kernels contain oil that becomes rancid more readily than the pulp oil, virgin olive oil was mixed with varying proportions of the crushed stones or kernels and kept in flasks plugged with cotton wool for several months, after which the acidity was determined. It was found that in each case the kernels had caused a slight increase in the amount of free acid, which was greater in proportion to the quantity of kernels used. The author has arrived at the following conclusions:—(1) That olive oil becomes slightly acid when kept in prolonged contact with the kernels, the acidity increasing with the proportion of kernels. (2) That oil extracted from the kernels with ether has an acidity (1.84 per cent.) which at first differs but little from that of pulp oil (1.86 per cent.), but that in time the acidity increases considerably (e.g., a sample kept for 18 months had an acidity of 10.18 per cent.). (3) That when the percentage of kernels does not exceed the normal amount in the fruit (12 per cent.) the pulp oil does not undergo any change in its organoleptic character, whilst the slight increase in the acidity is negligible. (4) That, in practice, no injurious effect need be feared from the short contact of the pulp oil with the crushed stones. (See also this J., 1898, 1955.)

—C. A. M.

Carbon Dioxide in Seeds during Germination; Origin of — E. Urbain. XXIV., page 1047.

FRENCH PATENTS.

Liquids containing Glycerin; Treatment of — E. A. Barbet and L. Rivière. Fr. Pat. 338,962, July 31, 1903. ✓

THE liquid is treated with silicofluoric acid to precipitate the salts of potassium, sodium, &c., the precipitate is washed, and the glycerin separated from the filtrate and washings. The addition of alcohol before the filtration increases the insolubility of the silicofluorides. In the case of the products of alcoholic fermentation (Vinasses, &c.), the liquid is first concentrated to 10° or 12° B. in the presence of lime or calcium carbonate, and then filtered, and the filtrate treated with silicofluoric acid, the excess of which is neutralised with sodium or calcium carbonate. The liquid is next filtered, with or without the addition of alcohol (which is subsequently evaporated), the clear filtrate concentrated, and the residual crude glycerin purified, e.g., by osmosis, as described in Fr. Pats. 323,373 and 330,939 (this J., 1903, 502, 1101).—C. A. M.

Soaps; Use of "Tangue" [Silicious Clay] in the Manufacture of — C. Sizaret. Fr. Pat. 343,398, May 24, 1904. ✓

THE soap is incorporated with about 25 per cent. of "tangue," an extremely fine silicious clay found principally on the sea coast.—C. A. M.

Soap; Manufacture of Hard Rosin. — [for *Paper Manufacture*]. K. Fischer. Fr. Pat. 343,617, May 11, 1904.

A HARD soap in solid form is prepared by mixing the required proportions of rosin and "soda" with the smallest possible amount of water which is continually renewed by condensation during the boiling, until the saponification is complete, after which the water is allowed to evaporate. Special apparatus claimed for this purpose consists of a boiler divided by means of a false bottom into two compartments, the upper of which is provided with means for condensing the evaporated water, and communicates by means of tubes, &c. with the lower compartment in which is the heating arrangement.—C. A. M.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(A.)—PIGMENTS, PAINTS.

UNITED STATES PATENT.

Paint Composition. W. A. Hall, Bellows Falls, Vt. U.S. Pat. 771,241, Oct. 4, 1904.

SEE Eng. Pat. 26,903 of 1903; this J., 1904, 328.—T. F. B.

FRENCH PATENT.

Lakes [from Azo Dyestuffs]; Process for Preparing New. Soc. Anon. Prod. F. Bayer et Cie. Fr. Pat. 343,631, June 1, 1904.

LAKES of various shades of red, fast to light, are obtained by precipitating, on a suitable substratum, the azo dyestuffs formed by combining the diazo derivatives of 2-naphthylamine-1.6-disulphonic acid or of 2-naphthylamine-3.6-disulphonic acid with naphtholsulphonic acids. Bluish-red lakes are obtained, for example, by combining the diazo derivative of either acid with 2-naphthol-3.6-disulphonic acid; a yellowish-red lake is produced from the diazo derivative of the 3.6-acid with 2-naphthol-3.6.8-trisulphonic acid, whilst a brilliant red is obtained by combining the same diazo compound with 1-naphthol-3.6-disulphonic acid.—T. F. B.

(B.)—RESINS, VARNISHES.

UNITED STATES PATENT.

Wood; Process of Destructive Distillation of Resinous. C. E. Broughton. U.S. Pat. 771,706, Oct. 4, 1904. III., page 1023.

(C.)—INDIA-RUBBER, &c.

Castilloa Elastica; The Latex of. A. W. K. de Jong and W. R. Tromp de Haas. Ber., 1904, 37, 3298—3301.

THE authors have examined a latex derived from 10-year-old rubber trees (*Castilloa Elastica*) grown in Java, but obtained originally from Kew. The results are much at variance with those described by C. O. Weber for a similar product (this J., 1903, 1200), and no support can be found by the author for Weber's theory of albumin-coagulation. The Java latex contained isolated particles and was of acid reaction. It was coagulable by methyl and ethyl alcohol, acetone, and glacial acetic acid, but not by albumin-coagulating agents, nor was an oxydase present. The latex was diluted with water, allowed to stand, and the cream collected. This was re-washed in a similar manner 12 times, but the cream still formed a white milky emulsion with water, like the original juice. After pasteurisation, the latex was coagulable by glacial acetic acid and acetone, but not by alcohol or by heating. By leaving *Castilloa* rubber in contact with ether, a thick syrup, unfilterable, except after addition of more ether, was obtained. After standing for 24 hours to settle, this liquid contained 8.7 to 9.3 per cent. of crude rubber. Also when the latex itself was extracted with ether, 7.9 to 8.2 per cent. of crude rubber was found in the filtered solution, so that the latex appears to contain rubber as such, and, moreover, rubber that is soluble in ether. As

regards tannin, fresh latex was filtered, the liquid portion treated with lead acetate, and the precipitate decomposed with hydrogen sulphide. The resulting liquor when dried over sulphuric acid yielded a yellow brittle solid, which contained 30 per cent. of tannin by the hide-powder method (cf. Weber, *loc. cit.*).—R. L. J.

India-Rubber; Action of Radium Rays on. R. Dittmar. XXIV., page 1048.

ENGLISH PATENTS.

Rubber and Ebonite; Treatment and Utilisation of Waste Vulcanised. V. de Karavodine, Paris. Eng. Pat. 7795, April 2, 1904. Under Internat. Conv., July 23, 1903.

SEE Fr. Pat. 338,945 of 1903; this J., 1904, 991.—T. F. B.

Rubber Waste; Process for Devulcanising or Regenerating. R. B. Price, Chicago. Eng. Pat. 17,313, Aug. 8, 1904. Under Internat. Conv., May 26, 1904.

SEE U.S. Pat. 762,843 of 1904; this J., 1904, 719.—T. F. B.

FRENCH PATENT.

Rubber; Regeneration of. M. Pontio. First Addition, dated April 18, 1904, to Fr. Pat. 338,048 of Oct. 16, 1903 (this J., 1904, 615).

If petroleum be used alone as the solvent, it should be the fraction which boils between 125° and 140° C. If, however, the b. pt. be somewhat higher, it may be lowered to the required degree by the addition of benzene or toluene. When necessary, amyl alcohol may be substituted for acetone or alcoholic soda to free the rubber from sulphur and traces of solvent.—F. D. T.

XIV.—TANNING; LEATHER, GLUE, SIZE

UNITED STATES PATENT.

Leather Substitute; Manufacture of an Artificial. G. Ebert, Rixdorf, Assignor to R. Piesbergen, Berlin. U.S. Pat. 772,646, Oct. 18, 1904.

SEE Eng. Pat. 15,629 of 1904; this J., 1904, 906.—T. F. B.

FRENCH PATENTS.

Tannin; Cold Extraction of under Reduced Pressure. L. Castets. Fr. Pat. 343,679, June 3, 1904.

MECHANICAL details are given of a plant for the cold extraction of tannin under reduced pressure. The main features are a series of five closed cylindrical extraction vats, mounted on trunnions and in connection with a pump and reservoir, so arranged that the liquors, as they increase in strength, come in contact with materials richest in tannin, also a sixth similar vessel supplied with refrigerating apparatus for the deposition of resins and colouring matters.

—R. L. J.

Artificial Leather; Process for the Manufacture of the same. J. B. Granjon and J. F. L. Berchet. Fr. Pat. 343,704, June 4, 1904.

ONE or more sheets of cardboard are covered with a mixture of asphalt, bitumen of Judæa, tar, and resin. The sheets thus treated are heated by steam to about 100° C., and are then passed between steam-heated rollers. If the leather be required for straps, strips of linen or metal may be placed between the sheets before rolling.—F. D. T.

XV.—MANURES, Etc.

Phosphoric Acid of Manures; Effect of Liming on. B. Schulze. Bied. Centr., 1904, 33, 653—654; from *Fühling's Landw. Zeit.*, 1904, 53, 186, 216, and 361.

THE effect of the phosphoric acid of bone meal on soil poor in lime, may very nearly approach that of phosphoric acid soluble in citric acid. Liming has very little effect as regards water-soluble phosphoric acid, but more on

citric acid-soluble phosphoric acid, and most of all on the phosphoric acid of bone meal. In the case of spring manuring with phosphoric acid, a simultaneous application of burnt lime is the most injurious. Autumn manuring with lime is less injurious, whilst the least effect is produced when the lime is applied in the form of carbonate in the autumn. The injurious effect of lime on the activity of phosphoric acid in the soil, especially the phosphoric acid of bone meal, is due to the neutralisation of the acid constituents of the soil. The formation and decomposition of organic substances in soils is of no small importance in the nutrition of crops with phosphoric acid.—N. H. J. M.

Calcium Cyanamide; Agricultural Employment of — M. Gerlach. Bied. Centr., 1904, 33, 649—651; from Mitt. d. deutsch. landw. Ges., 1904, [8]. (See this J., 1903, 809.)

THE results of pot experiments showed that calcium cyanamide was equal to ammonium salts and nitrate of soda. In field experiments lower results were obtained, due perhaps to loss of nitrogen in the form of ammonia. Calcium cyanamide can be readily converted into ammonium sulphate.—N. H. J. M.

FRENCH PATENTS.

Manure in Powder; Process for making — by means of Phosphorites and other Natural Phosphates. W. Mathesius. Fr. Pat. 848,820, June 9, 1904. Under Internat. Conv., June 13, 1903.

SEE Eng. Pat. 13,861 of 1904; this J., 1904, 907.—T. F. B.

Humous Manures; Manufacture of — J. J. Boutan. Fr. Pat. 338,981, Aug. 13, 1903.

PEAT, the humous basis of these manures, is treated with a concentrated solution of potassium salts, rich in the carbonate, such as may be derived from the charred waste of the vinous or molasses distilleries; or by a mixture of potassium sulphate and chalk, to obtain a "humo-potassic" manure. Or, a "humo-phosphatic" manure is prepared by incorporating peat previously rendered alkaline, with insoluble phosphates in which the phosphoric acid, or part of it, has been rendered soluble by humous matter, together with such alkaline salts as those named, or by acids. Sodium or ammonium salts may in some cases replace the potassium salts in the preparation of the manures.—E. S.

Sewage and Water; Precipitant for use in Purification of — [Manure.] J. M. Lallemand and A. Soutière. Addition to Fr. Pat. 823,900 of Aug. 14, 1902. XVIII. B., page 1040.

XVI.—SUGAR, STARCH, GUM, Etc.

Sugar Factories; Micro-organisms in the Juices of — H. A. Schöne. Z. Ver. deutsch. Zuckerind., 1904, 1060—1090. (See this J., 1901, 733.)

THE author has made a careful study of the nature, properties, and conditions of growth of the various micro-organisms which he has isolated from the juices of beet-sugar factories. The organisms are dealt with according to the following groups, the nature of the acids produced by them being also noted:—Group 1. *Leuconostoc mesenteroides* ("frog-spawn fungus"), forming chiefly lactic acid; mucus-forming *coccus* I., producing acetic and succinic acids and a little lactic acid; mucus-forming *coccus* II., producing acetic and *d*-lactic acids. Group 2. Coli-like bacteria: A, producing a little formic acid, much succinic acid, *l*-lactic acid; B, producing acetic and *l*-lactic acids; C, producing acetic acid, much succinic acid, *l*-lactic acid; D, producing acetic acid, a little valeric acid, much succinic acid, *d*-lactic acid. Group 3. *Clostridium gelatinosum* Laxa, producing acetic and lactic acids; *B. mesentericus fuscus*, producing acetic acid and a little valeric acid; *B. subtilis*, producing little acid (?). Group 4. Indifferent and accidental organisms: An acid-forming *coccus* producing *d*-lactic acid and traces of volatile acids; rodlet bacteria, similar to lactic bacteria; yeasts and mould fungi.

The author discusses the occurrence of the above organisms in nature, and the manner in which they enter the juice. The harm which these organisms effect in the sugar factories is due principally to the production of gelatinous and mucous carbohydrates at the expense of the sugar. This property is a very general one, and accounts for a considerable proportion of the losses during manufacture. Sugar is also lost by the formation of acids, alcohol, and gases under microbial influences and by the activity of the inverting enzymes secreted by the organisms. Many of these organisms are remarkably resistant to the influence of high temperatures and of most antiseptics; and the inverting enzymes secreted by them are still more resistant than the organisms themselves.—J. F. B.

Sugars; Semicarbazones of Reducing — Maquenne and Goodwin. Bull. Soc. Chim., 1904, 31, 1075—1078.

THE semicarbazones of arabinose, rhamnose, xylose, dextrose, mannose, galactose, lactose, and cellose are described, their melting points, solubility, and rotatory power being given. The semicarbazones of maltose and levulose could not be obtained in a pure state. All the semicarbazones exhibited multi-rotation, the rotatory power only becoming constant after the solution had stood for some days. The rotatory power was, except in the case of rhamnose semicarbazone, considerably lower than that of the original sugar. The substances had no sharp melting points, the change of physical state being always accompanied by an evolution of gas. These derivatives are not considered to possess any value for the identification of the sugars, as their physical constants are not sufficiently well defined.

—T. F. B.

Sugar in Molasses and Cane Sugar Factory Products; Determination of Crystallisable and Reducing — H. Pellet. XXIII., page 1047.

Sulphurous Acid in Molasses; Determination of — E. Pozzi-Escot. XXIII., page 1047.

ENGLISH PATENT.

Honey Substitute; Manufacture of a — A. Oetker, Bielefeld, Germany. Eng. Pat. 12,754, June 6, 1904.

500 GRMS. of cane sugar are mixed with 0.5 grm. of calcium formate and 0.5 grm. of tartaric acid, sufficient caramel to produce the desired colour being also added. 500 grms. of this mixture are heated to boiling with 125 grms. of water, then kept in a warm place for 30 minutes, and afterwards cooled.—W. P. S.

FRENCH PATENTS.

Diffusion [Sugar]; Continuous Process of — J. Galloo. Fr. Pat. 338,971, Aug. 7, 1903.

RASPED beetroot pulp is caused to travel through a diffusion vessel divided into several compartments. At the same time an extracting liquid is passed through the diffuser in the opposite direction. Each compartment of the vessel is provided with mixing rakes, which keep the pulp in suspension and facilitate the extraction of the sugar.—J. F. B.

Massequite; Continuous Apparatus for Filtering and Washing — H. Roy. Fr. Pat. 343,194, May 16, 1904.

THE apparatus consists essentially of a cylindrical vessel provided with a conical lower portion, around the walls of which a perforated filtering surface is arranged. The massequite is forced in at the bottom of the vessel, and is agitated in contact with the filtering surface by means of stirring arms, whilst at the same time it is subjected to the action of compressed air introduced at the top of the apparatus. The syrup passes through the filtering surface, and drained sugar is discharged continuously from the upper portion of the vessel. By interposing one or more cylindrical sections provided with separate stirrers and filtering surfaces between the lower and upper portions of the vessel, the massequite may be systematically washed in its upward course by means of "clairce" syrups introduced at various points.—J. F. B.

Starch Derivatives; Production of — J. Kantorowicz.
Fr. Pat. 343,614, April 23, 1904.

STARCH is treated in presence of water with liquids which are miscible with water, but which prevent the gelatinisation of the starch when caustic soda is subsequently added. For instance, 100 parts of potato starch are mixed with alcohol at a strength of 50–90 per cent., so as to produce a milky liquid in which the starch is held in suspension, and then 40 parts of a solution of caustic soda at 50° B. are added. The mass thickens, and is allowed to remain for one hour; it is then neutralised by acetic acid, and the resulting precipitate is filtered off and dried. The product yields a paste when mixed with 10 times its weight of water.—J. F. B.

Spirits, Cattle Food, and Glucose; Preparation of —
from Plants and Vegetable Refuse. Internat. Spiritus-
Ind. Fr. Pat. 343,745, May 11, 1904. XVII., page 1039.

XVII.—BREWING, WINES, SPIRITS, Etc.

Malt; Relation between Moisture, Grist, and Yield in —
K. Regensburger. Z. ges. Brauw., 1904, 27, 649–651.

FOUR Bavarian malts were allowed to absorb moisture in a moderately damp place, and after definite periods of time, samples were crushed in a laboratory Seck mill set at 25°, and the moisture determined. The crushed malt was then classified on a Vogel sieve, the latter being shaken for 10 minutes, with the shaking apparatus working at 350 revolutions per minute. As the percentage of moisture in the malt increased, the proportion of grains also increased, mainly at the expense of the grist, but to a certain extent also at that of the fine meal. With an increase of 8–9 per cent. in the moisture, the proportion of grains increased to from four to five times the original amount. This is due to the toughness imparted to the corns by an increased moisture content, whereby not only do the grains resist crushing, but considerable amounts of the contents of the corns adhere to the husks, especially at the tips of the corns. With regard to the yield of extract, it was found that with imperfectly modified malts, an increased moisture content caused a distinct decrease (about 2.3 per cent.) in the yield calculated on the dry substance. With well-modified malts, the moisture content, so long as it was within the limits usually met in practice, viz., from 2 to 8 per cent., appeared to have little influence on the yield of extract, but with a very high content of moisture, e.g., 9 per cent. and over, the decrease in yield of extract was as high as 1 per cent. In these experiments the extract was determined by an infusion method. Experiments with the decoction method showed that with the malts containing a low percentage of moisture, the yield of extract was increased by boiling the mash, but when the moisture content was high, boiling the mash had practically no influence on the yield of extract.—A. S.

Saccharomyces Saturnus Klöcker: A New Species of
Saccharomyces with Characteristic Spores. A. Klöcker.
Woch. f. Brau., 1904, 21, 676–678.

THE author describes a new species of *Saccharomyces* which belongs to the same group as *S. anomalus* (Hansen). It differs from the latter chiefly in the shape of its spores, and in its ability to invert and ferment cane sugar. It rapidly forms a white, wrinkled film on beer-wort and other saccharine media. The cells of the fresh films are spherical or oval in shape, with a diameter of 4–6 μ . In older films "giant" forms with thickened walls and chains containing elongated cells are observed. The cells of films grown on maltose-yeast-water media nearly always contain spores. The limits of temperature for budding lie between 2° and 37° C. The spores are lemon-shaped, more or less regular, and are surrounded at the centre by a protruding band (reminiscent of the planet Saturn). The dimensions of the spores from point to point are 3 μ ; they contain a spherical, refractive corpuscle, probably of fat. Spores are produced on a gypsum block most readily at a temperature of about 25° C. This yeast ferments dextrose, fructose, raffinose, and cane sugar. Very little alcohol is formed during fermentation in beer wort, but an odour of fruity ethers,

probably ethyl acetate, is developed. Maltose, lactose, and arabinose are not fermented. This species was first discovered in a sample of earth from the Himalayas; later, the same or a very similar species has been found in samples of Danish and Italian earths.—J. F. B.

Schmitz Brewing Process; Remarks on the — C. Bleisch.
Z. ges. Brauw., 1904, 27, 681–683.

ACCORDING to the Schmitz process, the malt, ground rather more finely than usual, is mashed and saccharified at any desired temperature in the mash-tun; the whole mash is then transferred to the mash-copper and boiled. The boiling mash is pumped into a special steam-jacketed clearing tun, the wort is run off, and the residue is sparged, still at the boiling temperature. Since a further solution of the starch is effected by the boiling, the wort containing this residual starch is cooled by an arrangement in the bottom of the clearing tun, and subjected to a further saccharification by means of a diastatic extract reserved at the beginning of the mashing. The author has studied this process comparatively with the ordinary process. The advantages determined in favour of the Schmitz process included a considerable shortening of the time required for running off the wort and sparging, owing to the very high temperature employed, and a slight improvement in the yield. A question arises in connection with the possibility of the extraction of matters with an undesirable flavour from the grains by running off and sparging at the boiling temperature. Whether such a tendency is counteracted by the curtailment of the time of contact can only be determined by long practice. The increase of yield attributable to a better solution of the badly modified starch was surprisingly small, and the greater portion of the observed increase was due to the favourable conditions under which running off and sparging were effected. In comparison with a modern clearing tun of the best construction this increase of yield to the advantage of the Schmitz process would, however, tend to disappear.—J. F. B.

Beer; Causes and Prevention of Altered Flavour in —
with New Plant. H. Vogel. Ann. de la Brass., 1904, 7,
368–372.

ONE cause of altered flavour in beer produced in new plant, is the use of cheap shellac substitutes (impure pine resin, artificial turpentine, &c.) for varnishing the fermenting tuns and other vessels. To prevent this risk the varnish may be tested by pouring a little into a bottle, turning the latter upside down, and leaving the varnish to dry; the presence of any unpleasant smell will indicate that the varnish is not fit for use in the brewery. In coppers of more modern type the flues extend only about one-third up the sides, instead of half-way, and unless the mashing and boiling are modified accordingly, the beer will taste thin, as though from lower gravity wort. In steam coppers the lower initial temperature prolongs diastatic action, thus increasing the proportion of readily fermentable sugars, and consequently the attenuation. Unless coppers heated by steam coils be also provided with stirrers at the bottom, the beer will be liable to glutin haze and changed flavour. Excessive reduction of the individual area of the perforations in the false bottom may retard filtration, by the retention of air bubbles in the holes. This delay results in the extraction of flavouring matters from the grains, and affects the taste of the beer. It may be prevented by running in the sparging liquor from below, and thereby clearing out the holes. The vibration of a mashing machine will shake the grains into a compact mass and retard filtration. Dust produced by building operations is a fertile source of sarcina-sickness in beer, the altered flavour being then often erroneously attributed to the new plant. Wort may be boiled in an iron pan as well as in a copper vessel, any small quantity of iron dissolved in the former case being eliminated in cooling, or during fermentation; but an alteration in flavour will follow the introduction of iron into the finished beer. The water condensed in the dome of the copper should be discharged outside, for if the wort be boiled too briskly, hops and scum may adhere to the dome and scorch, and the materials extracted by the water of condensation will alter the flavour of the beer.

—C. S.

Beer; Behaviour of — towards Metals. J. Brand.
Z. ges. Brauw., 1904, 27, 713—716.

AFTER commenting on the various notes which have appeared recently on this subject (see this J., 1904, 268, 332, 595, and 796), the author states that his experience does not confirm the conclusions as to the unsuitability of tin surfaces for contact with beer. He exposed iron plates, both black and polished, and tinned iron plates to the action of pale and dark beers. After 12 hours' exposure, the beers containing the unprotected iron plates had become very turbid and had completely changed in colour, whilst those containing the tinned plates were only slightly turbid and otherwise unchanged. After seven days the beers with the iron plates were no longer recognisable as beer, and contained 0.42 per cent. of dissolved iron per litre, whilst those in contact with the tinned plates were slightly turbid, but still drinkable. The author concludes that the evil effects of tin and tinned surfaces in contact with beer are quite considerable in comparison with those brought about by plain iron, especially with regard to the injury to the flavour. It would be a mistake if tin and tin coating, which have done such good service hitherto in protecting iron vessels from the action of beer, were suddenly discarded.—J. F. B.

Fermentation Tuns; Effect of Chemicals employed for Removing Old Lacquer from — upon the Wood and Subsequent Coat of Lacquer. F. Schönbeld. Woch. f. Brau., 1904, 21, 667—668.

THE experiments showed that solutions containing caustic alkalis, such as a 5 per cent. solution of caustic soda or a 10 per cent. solution of sodium carbonate mixed with 5 per cent. of lime, cannot be entirely eliminated even when the tun is subsequently washed for two days with frequent changes of water. Consequently the new coat of lacquer does not adhere firmly to the wood, and in a very short time it begins to scale or to soften. In many cases also the outer layers of the wood fibres are considerably damaged or destroyed. Milder alkalis, such as a 20 per cent. solution of sodium carbonate or a 5 per cent. solution of "antiformin" (see this J., 1904, 125), do not appear to affect the new coating of lacquer, provided the tun has been thoroughly washed for two days. But if the washing be deficient, as may easily happen in practice, the new coat of lacquer is certain to suffer. The author concludes that all chemical agents should be avoided, and that the old lacquer should be removed only by mechanical means. The experiments also indicate that "antiformin," which is a valuable antiseptic, should not be employed incautiously for the disinfection of lacquered fermentation tuns, owing to its powerful solvent action on the varnish.—J. F. B.

Fluorine in Wine and Beer; Determination of —.
F. P. Treadwell and A. A. Koch. XXIII., page 1046.

ENGLISH PATENTS.

Malt-Kilns. J. Brackenbury, Burton-on-Trent.
Eng. Pat. 28,630, Dec. 30, 1903.

KILNS having a fire-shaft are constructed with an air-shaft surrounding the fire-shaft, both of which communicate with a mixing chamber situated below the drying-floor. The heat of the fire-gases induces an upward current of air through the air-shaft, the gases and air mixing in the chamber before reaching the drying-floor. Means for regulating the admission of air are provided.—W. H. C.

Alcohol and other Volatile Matters from Waste Products; Process for Recovering —. C. Tuckfield and G. de F. Garland, East Molesey. Eng. Pat. 26,860, Dec. 2, 1903.

THE wash or liquid to be treated is heated to a temperature a few degrees higher than its atmospheric boiling point, e.g., under a pressure of 10—40 lb. per sq. in.; this may be effected by providing a pressure valve on the worm before the point where the vapour passes into the condenser.

—J. F. B.

"Rousers" for Mixing Purposes. A. Pidgeon, West Ham, Essex. Eng. Pat. 642, Jan. 11, 1904.

THE invention relates especially to an improved form of "rouser" or mixer for incorporating finings in ales and

beers, or for blending wines or spirits. The "rouser" is constructed with a shoulder upon its length to prevent it touching the bottom of the vessel in which it is used. The top of the handle is made semi-spherical so that it can be "rolled around" in the palm of the operator's hand. The shoulder has a curved form, in order that every part of the vessel may be reached, and the blade is made of a special section, two or three types of which are figured.

—W. H. C.

FRENCH PATENTS.

Yeast Extracts; Eliminating the Bitter Flavour from —.
M. Elb. Fr. Pat. 343,712, June 4, 1904.

YEAST-EXTRACTS are treated, after evaporation, with an oxidising agent, preferably hydrogen peroxide. The precipitated matters are removed either by filtration or clarification. (See also Eug. Pat. 24,294 of 1903; this J., 1904, 996.)—J. F. B.

Lees and other Residues of Wine; Drying and Extracting the Alcohol from —. G. Grimard. Fr. Pat. 338,988, Aug. 17, 1903.

THE lees and marcs are dried in a closed vessel under vacuum at any suitable temperature, and the alcoholic vapours which are evolved are condensed.—J. F. B.

Cream of Tartar; Extraction of White Refined — from Marcs, before and after Distillation. G. Chiapetti.
First Addition, dated April 22, 1904, to Fr. Pat. 330,951, April 6, 1903. (See this J., 1903, 1099.)

IN the apparatus described in the original patent, refrigerators are interposed between each diffuser, in order to prevent the solution of tartaric and sulphurous acids, as it passes from one diffuser to the next, from being heated beyond a certain temperature by the hot marcs with which it comes in contact. In the distillation column, which is employed for the recovery of the alcohol from the marcs, the porcelain balls are replaced by plates having only one scrubbing-cap. The "head products" of distillation are collected separately from the "tailings" by means of two different receivers, above which is placed an inspection glass.—J. F. B.

Spirits; Apparatus for Continuous Rectification of —.
E. A. Barbet. Fr. Pat. 348,488, April 16, 1904.

SEVERAL improvements are described relative to apparatus for the continuous double rectification of alcohol, direct from the wines or from the phlegms. The new arrangements afford an accurate control of the analyser column and a certain auto-purification of the already purified phlegms; they do away with the passage of the vapour of the wine directly to the rectifying column, and supply this rectifier with a series of plates and a special condenser, in order to concentrate the "tail" products, the extraction of which facilitates rectification. An arrangement is interposed between the analyser and rectifier by which the phlegms may be purified by the admission of oxidising agents or other chemicals.—J. F. B.

Spirits, Cattle Food, and Dextrose; Preparation of — from Plants and Vegetable Refuse. Internat. Spiritus-Ind. Fr. Pat. 343,745, May 11, 1904.

WOOD, straw, or other vegetable matter is boiled under a pressure of 10 atmospheres with a dilute solution of caustic soda, the mass is diluted largely with water, and the cellulose is dissolved under a pressure of 20—24 atmospheres. The boiling mass is then treated under atmospheric pressure with ozonised oxygen or hydrogen peroxide. The saccharine solution so obtained may then be fermented with ordinary yeast or with "Koji," or may be evaporated to a syrup. (See also Fr. Pat. 342,555; this J., 1904, 944.)

—J. F. B.

Distillery Juices; Apparatus for Aerating and Decanting —. A. Hochart. Fr. Pat. 343,627, June 1, 1904.

THE saccharine juices coming hot from the presses or diffusers are delivered to the top of a cascade-refrigerator, consisting of tubes cooled internally by a current of water. As the juice traverses the refrigerator, air is blown across it by means of a ventilating fan. The cooled juice then

passes through a series of decanting basins, arranged in the form of steps, in which the sediment and waste fine pulp are deposited. Arrangements are made for the inversion of the sugar by treatment with sulphuric acid.

—J. F. B.

Liquids containing Glycerin; Treatment of — E. A. Barbet and L. Rivière. Fr. Pat. 338,962, July 31, 1903. XII., page 1035.

Water-Bath for Heating Liquids, or Liquids mixed with Solids. P. P. A. Andrieu. Fr. Pat. 343,321, May 21, 1904. I., page 1020.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(A.)—FOODS.

ENGLISH PATENT.

Eggs and other Alimentary Substances; Preserving Compound for — G. E. Grenard, Paris. Eng. Pat. 17,431, Aug. 10, 1904.

A MIXTURE is made of sodium silicate (20 kilos.), sodium phosphate (0.2 kilo.), sugar (0.2 kilo.), and water (60 kilos.). To this mixture is added a 13 per cent. solution of hydrochloric acid (20 kilos.), and the whole is then poured over the eggs or other substances, so as to completely cover them. After a few minutes the mixture forms a firm gelatinous mass round the eggs, &c.—W. P. S.

FRENCH PATENTS.

Coffee Substitute [Roasted Lupines]; Manufacture of a — G. Doudieux and L. Jacotin. Fr. Pat. 343,485, April 8, 1904.

THE substitute, which is said to possess the flavour of coffee, consists of roasted lupines which have been, either before or after roasting, treated with water, steam, and alcohol to remove substances objectionable to the taste.—W. P. S.

Food Product; Manufacture of a — B. Gross, Germany. Fr. Pat. 343,174, May 16, 1904.

WHITE phosphorus is burnt and the products of combustion distilled, when it is stated that a yellow solid and an oily liquid are obtained. Reduced iron is then dissolved in the liquid portion and the mixture poured into boiling water. The product, a white powder, is mixed with other food substances, either alone or in combination with the "yellow solid" and "oily liquid."—W. P. S.

Flour, Corn, and other Cereals; Process and Apparatus for Bleaching and Improving — W. T. Mercier. Fr. Pat. 343,805, June 8, 1904.

THE flour is subjected in a series of cylindrical chambers to the action of ozonised air mixed with a gas produced by the electrolysis of a solution of common salt or other suitable solution. The flour or other substance to be treated is previously air-dried.—W. P. S.

Spirits, Cattle Food, and Glucose; Preparation of — from Plants and Vegetable Refuse. Interat. Spiritus-Ind. Fr. Pat. 343,745, May 11, 1904. XVII., page 1039.

Water-Bath for Heating Liquids, or Liquids mixed with Solids. P. P. A. Andrieu. Fr. Pat. 343,321, May 21, 1904. I., page 1020.

(B.)—SANITATION; WATER PURIFICATION.

ENGLISH PATENT.

Sprayer [for Sewage Effluent]; Improved Construction of — R. H. Reeves, London. Eng. Pat. 23,746, Nov. 2, 1903.

THE sprayer, which is specially intended for spraying sewage effluent, is constructed with a socket and plug, having curved channels of irregular or spiral pitch, and is connected with the supply pipe by a straight reducing piece. The whole is arranged so as to revolve.—W. H. C.

FRENCH PATENT.

Sewage and Water; Precipitant for Use in the Purification of — J. M. Lallemand and A. Goutière. Second Addition, dated July 13, 1903, to Fr. Pat. 323,900, Aug. 14, 1902 (this J., 1903, 568).

ALUMINIUM phosphate "treated with hydrochloric or sulphuric acid" is added to the sewage. The sludge formed is rich in phosphoric acid and nitrogen, and is claimed as a manure.—W. P. S.

(C.)—DISINFECTANTS.

Bacteria; Destroying — by Boiling under Reduced Pressure. Schut. Z. Hyg.; through Brewers' J., 1904, 40, 673.

THE author finds that boiling the liquid in which bacteria or spores are suspended is more fatal to the micro-organisms than merely heating the liquid to the boiling temperature. By heating under diminished pressure, bacteria and spores may be killed without the physiological limits of temperature being exceeded. The use of saturated steam is more efficacious even than boiling. The powers of resistance possessed by micro-organisms vary considerably according to the temperature of cultivation and the medium in which the microbes are suspended; in the case of spores, the resistance decreases to a certain extent with the age of the culture. Heating at 60° C. for half an hour is sufficient to destroy the vegetative forms, especially of pathogenic germs.—A. S.

ENGLISH PATENTS.

Ozonising Air for Disinfecting Purposes; Apparatus for — A. d'Arsonval, G. E. Gaiffe, and G. Gallot, Paris. Eng. Pat. 27,358, Dec. 14, 1903.

SEE Fr. Pat. 337,531 of 1903; this J., 1904, 500.—T. F. B.

Antiseptic Preparations [from Rosin], and Process for Producing the same. H. Endemann, Brooklyn, U.S.A. Eng. Pat. 17,607, Aug. 12, 1904.

SEE U.S. Pat. 770,275 of 1904; this J., 1904, 996.—T. F. B.

FRENCH PATENT.

Insecticide. E. Manlouet. Fr. Pat. 343,829, June 9, 1904.

THIS insecticide consists essentially of an emulsion of petroleum, fatty soap, potassium carbonate, and ethyl and amyl alcohols. It may be used for impregnating wood as well as for agricultural purposes.—T. F. B.

XIX.—PAPER, PASTEBOARD, Etc.

ENGLISH PATENTS.

Beating or Triturating and Refining Pulp or like Fibrous Material; Apparatus for — J. H. Annandale, Polton, Scotland. Eng. Pat. 26,012, Nov. 28, 1903.

A DRUM mounted on a rotating shaft has radially disposed cutter blades projecting from it. The drum is surrounded by a fixed casing, also having cutter blades, so fixed that they project into the spaces between the blades of the drum. Means are provided for adjusting the spaces between the two sets of blades, for feeding and for withdrawing the pulp continuously.—W. H. C.

Paper; Manufacture of Pressed or Gafferred — G. Hennesen and P. Spix, München-Gladbach, Germany. Eng. Pat. 14,449, June 27, 1904.

By heating the engraved rollers or moulds employed for pressing patterns on paper or cardboard, the pressed portions of the product appear glossy, whilst the unpressed portions remain dull.—J. F. B.

Cornstalks, Sugar Cane, and Analogous Pithy Stalks; Process of Manufacturing Products [for Paper-making], from — V. Drewsen, New York. Eng. Pat. 15,397, July 8, 1904.

SEE U.S. Pat. 781,290 of 1903; this J., 1903, 876.—F. F. B.

Paper-making Machines; Impts. in — J. Bradley, Burnley. Eng. Pat. 18,117, Aug. 22, 1904.

IN order to minimise the friction on the wire in passing over the suction-box, the latter is divided longitudinally into three compartments. The central compartment serves as the suction-box proper, whilst the two outer compartments each contain a roller capable of freely rotating therein, and of being adjusted slightly in a vertical direction. These rollers revolve in troughs of water and project slightly above the level of the central suction-box. An air-tight joint between the rollers and the edges of the central compartment is made by means of compressible india-rubber tubes. The end-plates of the suction-box proper are adjustable for any width of paper, and their tops are faced with plate-glass, over which the wire slides with the least possible friction.—J. F. B.

UNITED STATES PATENT.

Wood-Pulp or Cellulose; Means for Refining — A. Wahlström, Hønefoss, Norway. U.S. Pat. 771,403, Oct. 4, 1904.

THE machine comprises a vertical rotary runner, having a plain peripheral grinding face, and a bedstone mounted beneath the runner and having a plain grinding surface encompassing the greater portion of one-half of the grinding face of the runner. Means are provided for adjusting the bedstone vertically with regard to the runner.—J. F. B.

FRENCH PATENTS.

Paper and Cardboard; Process of Sizing — F. Dobler. First Addition, dated April 29, 1903, to Fr. Pat. 328,178, Dec. 19, 1902. (See this J., 1904, 335.)

IN the process for sizing paper described in the original specification, the two separate sizing baths may be replaced by a single combined bath containing approximately: rosin soap, 20–50 parts; gelatin, 20–50 parts; aluminium sulphate, 20–50 parts; water, 1,000 parts.—J. F. B.

Soap; Manufacture of Hard Rosin — [for Paper Manufacture]. E. Fischer. Fr. Pat. 343,617, May 11, 1904. XII., page 1036.

Paper Coloured on One Side; Process and Apparatus for making — Leykam-Josefsthal Act.-Ges. f. Papier- und Druck-Ind. Fr. Pat. 343,186, May 16, 1904.

THE colour or other composition is applied to the web of the paper as it comes from the paper-making machine, the surface of the paper is felted ("seutré") by pressure, and the colour is caused to adhere firmly to the paper by subsequent drying. The apparatus consists of a tank with agitator for holding the colouring matter, which passes down a pipe provided with a cock and indicator, and discharges through a perforated tube into a small tank which overflows on to the surface of a cylinder; this cylinder is in contact with the paper, and revolves as the paper passes beneath it, thus applying the colour to the surface of the paper.—T. F. B.

Papers with Designs of all kinds, Coloured Paper, &c.; Process for making Glossy — Soc. Hennessen et Jansen, and Soc. Spix et Lindermann. Fr. Pat. 343,856, June 10, 1904.

SEE Eng. Pat. 14,449 of 1904, preceding these.—T. F. B.

Papers of all kinds, Coloured Paper, &c., having at the same time a Glossy and Matte Effect; Process for making Pressed or Gauftered — Soc. Hennessen et Jansen and Soc. Spix et Lindermann. Fr. Pat. 343,857, June 10, 1904.

SEE Eng. Pat. 14,449 of 1904, preceding these.—T. F. B.

Phonographic Records; Composition for — A. and L. Lumière. First Addition, dated June 16, 1903, to Fr. Pat. 338,849, June 8, 1903.

A FLEXIBLE protective coating for phonographic records is composed of nitrocellulose or acetylcellulose and a softening agent, such as a salt of a fatty acid or paraffin wax, dissolved in a common solvent.—J. F. B.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Magnesium Amalgam as a Reducing Agent. [Preparation of Absolute Alcohol.] T. Evans and W. C. Fetsch. J. Amer. Chem. Soc., 1904, 26, 1158–1161.

Preparation of the Amalgam.—Magnesium amalgam affords a convenient and economical means of effecting reduction of organic compounds. It is found that generally magnesium powder will amalgamate with mercury at ordinary temperatures, amalgamation starts slowly, but evolves heat, which causes the process to become more rapid. Some specimens of magnesium, however, refuse to amalgamate unless the process be aided by the employment of a warmed mortar. Amalgams containing 5 and 10 per cent. of magnesium were thus prepared; the latter were thickly fluid when first prepared, but set to a hard crystalline mass when cold.

Action of Magnesium Amalgam on Ethyl Alcohol.—Magnesium amalgam is without apparent action, in the cold, upon absolute ethyl alcohol, but readily reacts with alcohol containing a trace of water. It affords, therefore, a convenient means for the preparation and preservation of alcohol in an absolutely anhydrous condition.

Action of Magnesium Amalgam on Nitrobenzene.—By reducing a strong solution of nitrobenzene in ethyl alcohol with excess of 10 per cent. magnesium amalgam, starting the reaction with heat, and moderating it subsequently by cooling, finally continuing the process just below the boiling point of alcohol, a yield of 95.66 per cent. of the theoretical amount of azobenzene was obtained.—J. O. B.

Primula Camphor. H. Brunner. Schweiz. Woch. Chem. Pharm., 1904, 42, 305. Pharm. Centralh., 1904, 45, 688.

By distilling 300 kilos. of the roots of *Primula veris* (equivalent to about 20,000 plants), and extracting the distillate with ether, 170 grms. of crude primula camphor were obtained. When freshly distilled it forms a colourless liquid, becoming yellow on exposure to the air; sp. gr. 1.2155; b. pt. 255° C. It was identified as the methyl ester of *m*-methoxysalicylic acid, $C_6H_5 \cdot (1)COOCH_3 \cdot (2)OH \cdot (5)OCH_3$.—J. O. B.

Quinine Salts: Neutral Hydrochloride of Quinine. H. Carette. J. Pharm. Chim., 1904, 20, 347–355.

"NEUTRAL" quinine hydrochloride [*Quinina Hydrochloricum Acidum* P.B.] is obtained by dissolving one mol. of quinia in two mols. of hydrochloric acid in dilute aqueous solution, concentrating, and slowly cooling. The salt $C_{20}H_{24}N_2O_2 \cdot 2HCl + 2\frac{1}{2}H_2O$ crystallises in radiating and nodular groups. It is hygroscopic, but only liquefies in a very moist atmosphere. It parts with a small amount of its water of crystallisation at 20° C. in dry air, and with the whole at 102° C., acquiring a yellowish tint, which disappears on cooling. It loses no hydrochloric acid during this drying. It begins to melt at 80° C., and remains partially melted at 215° C., when it begins to decompose. When the salt is crystallised from solutions containing ethyl alcohol, bulkier crystals than the above are obtained, which have the formula $C_{20}H_{24}N_2O_2 \cdot 2HCl + 1\frac{1}{2}C_2H_5O$. In 95 per cent. alcohol, a supersaturated solution is formed from which large crystals are obtainable by sowing, or by rapid evaporation *in vacuo*. These crystals are stable when kept in a sealed tube. They part with the whole of the alcohol at 100° C. and with almost all at normal temperatures *in vacuo*. The same salt is obtained from solutions in absolute alcohol, and from 55 per cent. and 30 per cent. alcohol. The weaker alcohol more readily forms supersaturated solutions. The crystals obtained therefrom by sowing are very large, but do not keep so well in the sealed tube as those obtained from 95 per cent. alcohol, becoming dull and gradually opaque, and forming a fluid which is at first colourless, ultimately acquiring a reddish tint on exposure to light. Exposed to the air, they lose all the alcohol of crystallisation, absorbing water and being converted into the salt containing $2\frac{1}{2}$ mols. of water. When heated in the dark

to constant weight at 35°–50° C. a perfectly white, stable salt is obtained, which has the formula $C_{20}H_{21}N_2O_2 \cdot 2HCl + \frac{1}{2}H_2O$: the whole of the $\frac{1}{2}$ mols. of alcohol are given off, and $\frac{1}{2}$ mol. of water is combined. This salt is much less hygroscopic than the anhydrous hydrochloride obtained by heating the salt containing alcohol to 102° C. No appreciable loss of hydrochloric acid occurs when the salt $C_{20}H_{21}N_2O_2 \cdot 2HCl + \frac{1}{2}C_2H_5O$ is heated to 35° C., but at higher temperature this loss becomes considerable. The salt has no definite melting point.

Anhydrous "Neutral" Quinine Hydrochloride.—The anhydrous salt, obtained by drying either of the above to 102° C. or *in vacuo*, rapidly re-absorbs $2\frac{1}{2}$ mols. of water on exposure to the air. If the atmosphere be very moist, it combines with another $\frac{1}{2}$ mol., forming the salt $C_{20}H_{21}N_2O_2 \cdot 2HCl + 3H_2O$. It completely liquefies in an atmosphere saturated with moisture. It becomes yellow when heated to 165°–170° C., and melts to a brownish fluid at 180°–185° C. Its aqueous solutions are strongly laevo-rotatory; the $[\alpha]_D = -233^\circ$.—J. O. B.

Aconitine. H. Schulze. *Apoth.-Zeit.*, 1904, 19, 782–783. *Chem. Centr.*, 1904, 2, 1238–1239.

THE empirical formula of aconitine has been given as $C_{34}H_{45}O_{12}N$ by Dunstan (this J., 1891, 477; 1892, 366) and as $C_{34}H_{47}O_{11}N$ by Freund and Beck (this J., 1894, 589, 540). In the author's experiments several specimens of pure aconitine (m. pt. 197°–198° C.), prepared by recrystallising the pure commercial alkaloid from methyl alcohol, were analysed. The results obtained agree equally well with the formula of Freund and Beck, or with one differing from it by two atoms of hydrogen, viz., $C_{34}H_{45}O_{11}N$, but differ materially from the figures corresponding to Dunstan's formula. Aconitine hydrobromide, $C_{34}H_{47}O_{11}N \cdot HBr$, or $C_{34}H_{45}O_{11}N \cdot HBr$, separates from water in crystals containing $2\frac{1}{2}$ mols. of water, slowly expelled on heating to 115°–120° C. From a mixture of alcohol and ether, the compound crystallises with $\frac{1}{2}$ mol. of water, which is expelled at 110° C. The anhydrous salt and the compound with $\frac{1}{2}$ mol. of water melt at 206°–207° C., and the compound with $2\frac{1}{2}$ mols. of water at 160°–200° C. Aconine hydrochloride, $C_{32}H_{41}O_9N \cdot HCl$, or $C_{32}H_{39}O_9N \cdot HCl$, was prepared by heating aconitine with 20 times its weight of water in an autoclave under 6–7 atmospheres pressure, and treating the product according to Dunstan and Passmore's method (this J., 1892, 366). It forms crystals containing 2 mols. of water, m. pt. 175°–176° C. The salt loses its water of crystallisation only incompletely at 120° C., but rapidly becomes anhydrous at 100° C. *in vacuo*.—A. S.

Ledum Palustre; The Stearoptene of the Essential Oil of —. Lomedse. *Chem.-Zeit. Rep.*, 1903, 284; *Pharm. Centralh.*, 1904, 45, 590.

DISTILLATION with live steam of the inflorescences and young shoots of *Ledum palustre* afforded 1.5 per cent. of essential oil in 1901 and 0.5 per cent. with the 1902 crop. The oil was a viscous fluid which deposited crystals on standing. The stearoptene was found to be only partially separable by cooling the alcoholic solution of the oil; it was therefore obtained, as a residue, by distillation *in vacuo* under 20 mm. pressure at 80° C. Recrystallised from alcohol, this residue furnished long, colourless, acicular crystals, m. pt. 104° C.; b. pt. 281° C. in an atmosphere of carbonic anhydride at 770 mm. pressure. It had the formula $C_{15}H_{25}O$.—J. O. B.

Otto of Rose. W. H. SIMMONS. *Chem. and Druggist*, 1904, 65, 703.

THE author has applied the iodine absorption method (see this J., 1904, 686) to several samples of this season's otto of rose, and finds that the results confirm the value of this test in judging of the purity of the oils. Of the samples examined, those which, according to their other constants as well as their odour, appeared to be genuine, gave iodine values well within the limits proposed (187–194), whilst those which, according to their other characters, might be regarded as suspicious or adulterated, gave values ranging from 199 to 210. The determination of the refractive index has been proposed by Parry and others as a means

of detecting adulteration of otto of rose. The author determined this constant for 36 samples, 23 of which were genuine, whilst the remaining 13 were of doubtful quality. The satisfactory samples gave an average refractive index of 1.4626, a maximum of 1.4634, and a minimum of 1.4592, whilst the doubtful specimens gave values ranging from 1.4615 to 1.4770. It appears from these results that the determination of the refractive index is of little value, as the generally accepted limits, 1.4600 to 1.4650 or 1.4670, would cover many adulterated samples, whilst where the refractive index was beyond the limit, the other characters of the oil would also be abnormal.—A. S.

Orchella Lichens; Some Substances present in —. Bonceray. *Bull. Soc. Chim.*, 1904, 31, 1097–1103.

THE lichens *Rocella Montagnei* and *Dendrographa leucophaea* were found to contain erythrin, and *Rocella Tinctoria* lecanoric acid as the chromogen. Orcinol in a free state was detected in all the above varieties. New methods are given for the preparation of pure lecanoric acid and erythrin from the respective lichens; the melting points were found to be: lecanoric acid, 201° C.; erythrin, 164° C.—T. F. B.

Siberian Fir; Essential Oil of —. J. Schindelmeiser. *Apoth.-Zeit.*, 1904, 19, 815–816.

Characters of Pure Oil of Siberian Fir.—Sp. gr. not under 0.918 at 17° C.; $n_D = 39^\circ 40'$ at 17° C.; esters as bornyl acetate not under 35 per cent.

Characters of Commercial Specimens of Siberian Fir Oil.—Sp. gr. at 17° C., 0.911–0.915; $n_D = 29^\circ 18'$ to $34^\circ 30'$ at 17° C.; esters as bornyl acetate in the fractions boiling above 190° C., 19.5 to 30 per cent. From the fraction containing the *l*-pinene and *l*-camphene, and having an optical rotation of $n_D = -24^\circ 13'$ to $-26^\circ 15'$ at 17° C., it is possible to isolate a small amount of a hydrocarbon boiling at 174°–180° C., and having $n_D = -18^\circ 28'$ at 17° C.; this fraction probably contains inactive dipentene. The commercial oils are probably adulterated with the cheaper pine-needle oil or with turpentine oil. Since the value of Siberian fir oil depends on its high percentage of laevo-bornyl acetate, which renders it valuable for the synthetic preparation of camphor, these figures are significant.—J. O. B.

Copaiba Balsam; Surinam —. L. van Italie and C. H. Nieuwland. *Pharm. Weekblad*, 1904, [40]; *Apoth.-Zeit.*, 1904, 19, 816.

FROM the examination of seven commercial samples of Surinam copaiba balsam, it was found that two varieties occur, one thick like Maracaibo copaiba balsam, the other thin like Para balsam. The colour ranges from light yellow to brown; some specimens have a feeble fluorescence. The specific gravity ranges from 0.9096 to 0.9611; acid value from 14.65 to 59.19; ester value from 9.7 to 18.21; percentage of essential oil, from 41.0 to 71.6. Surinam copaiba balsam is not soluble in 5 volumes of absolute alcohol, nor in 20 volumes of 90 per cent. alcohol. It gives a slightly turbid solution with carbon bisulphide. Towards other solvents it behaves like South American balsams. On shaking with one-third of its volume of 10 per cent. ammonia solution it forms an emulsion from which oily drops separate out on standing. When agitated with chloral hydrate solution, the essential oil separates on standing, but the lower solution of resin has no characteristic colour such as is the case with gurgun balsam.

Characteristic Reaction for Surinam Copaiba Balsam.—A mixture of equal volumes of Surinam copaiba balsam and acetic anhydride gives a fine blue colour with a trace of sulphuric acid. Maracaibo balsam does not give this reaction.

Essential Oil of Surinam Copaiba Balsam.—The essential oil contains a sesquiterpene alcohol, $C_{15}H_{25}OH$, forming colourless and odourless crystals, m. pt. 113.5°–115° C., which begin to sublime at 80° C.; also two sesquiterpenes, one laevo-, the other dextro-rotatory, and a small quantity of cadinene.—J. O. B.

Active Oxygen in Organic Persulphates; Quantitative Determination of —. A. Wolff and B. Wolfenstein. *XXIII*, page 1046.

Dinitro-aminophenol (Picramic Acid); New Method of Preparation of — [and Determination of Potassium]. A. Frébault and J. Aloy. XXIII., page 1046.

Arsenic in "Reduced Iron"; Determination of —. C. A. Hill and J. C. Umney. XXIII., page 1046.

ENGLISH PATENTS.

Iron and Arsenic; Process of Manufacturing Soluble Compounds containing —. A. G. Brookes, London. From Chem. Werke Hansa, G. m. b. H., Hemelingen, Germany. Eng. Pat. 21,382, Oct. 5, 1903.

SEE Fr. Pat. 336,127 of 1903; this J., 1904, 883. The compounds may also be prepared by heating spathic iron ore, or other natural ferrous carbonate, with glycerino-arsenic acid (arsenic acid dissolved in glycerin) out of contact with air, until evolution of gas ceases. The solution is filtered, and the filtrate evaporated under reduced pressure, a feeble current of carbon dioxide being passed through it.—T. F. B.

Protocatechuic Aldehyde; Manufacture of —. A. J. Boulton, London. From F. Fritzsche & Co., Hamburg. Eng. Pat. 15,784, July 15, 1904.

PROTocatechuic aldehyde is prepared by heating heliotropin with acid and water without exceeding a pressure of 12 atmospheres, or a temperature of 190° C. The reaction is facilitated by using certain acid salts, especially sodium bisulphite, in place of the acid. The reaction can also take place in the presence of a solvent for heliotropin, such as a hydrocarbon or alcohol. (Compare Fr. Pat. 326,775 of 1902; this J., 1903, 819.)—F. S.

Pyrocatechol Derivatives; Manufacture of —. O. Imray, London. From Farbwerke vorm. Meister, Lucius und Brüning, Höchst-on-the-Maine, Germany. Eng. Pat. 25,480, Dec. 3, 1903.

DERIVATIVES of pyrocatechol, such as methylaminoacetyropyrocatechol, $\text{CH}_3\text{NH}\cdot\text{CH}_2\cdot\text{CO}\cdot\text{C}_6\text{H}_3(\text{OH})_2$, can be produced by the interaction of a halogen-acetyropyrocatechol and ammonia or a primary aliphatic amine. These keto derivatives can, if required, be reduced to the corresponding alcohol bases.—F. S.

FRENCH PATENT.

Alcohols, Ethers, Acetic Acid, &c.; Process for making —. Cie. Urbaine d'Eclairage par le Gaz Acétylène. Fr. Pat. 338,965, Aug. 3, 1903.

THE claims are for a continuous process for making ethylene, and converting it into ethyl hydrogen sulphate, which is used as a starting point for making alcohol, ether, acetic acid, &c. A suitable oxide, such as glucinum, lithium, or manganese oxide, is mixed with 50–60 per cent. of lime or baryta, and with coke, anthracite, pitch, or other suitable carbonaceous material, and the whole heated to form a carbide; this is decomposed with water in an ordinary acetylene generator, and the ethylene formed, is absorbed by sulphuric acid in an apparatus to which one of the claims relates.—T. F. B.

Methyl Groups of Aromatic Hydrocarbons; Oxidation of the —. Badische Anilin und Soda Fabrik. Fr. Pat. 338,990, Aug. 17, 1903.

SEE Eng. Pat. 17,982 of 1903; this J., 1904, 910.—T. F. B.

Barbituric Acid; Process for Transforming Iminobarbituric Acids into —. Maison E. Merck. Fr. Pat. 343,673, June 3, 1904. Under Internat. Conv., July 11, 1903.

IMINOBARBITURIC acids are converted into barbituric acids by heating with mineral acids. For example, iminodiethylbarbituric acid is boiled for some minutes with a solution of

hydrochloric acid (1:3); diethylbarbituric acid results. The iminobarbituric acids result from the condensation of cyanoacetic esters with urea in presence of alkali alcoholates.—T. F. B.

Dialkylbarbituric Acids; Process for Preparing —. Farbenfabr. vorm. F. Bayer & Co. Fr. Pat. 343,834, June 9, 1904. Under Internat. Conv., Sept. 25, 1908.

SEE Eng. Pat. 21,833 of 1903; this J., 1904, 76.—T. F. B.

Cream of Tartar; Extraction of White Refined — from Marcs, before and after Distillation. G. Chiapetti. Addition to Fr. Pat. 330,951 of April 6, 1903. XVII., page 1039.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Mercuric Iodide; Two Emulsifiable Double Compounds of —. Lüppo-Cramer. Eder's Jahrbuch, 1904, 18, 12. Chem.-Zeit., 1904, 28, Rep. 295.

WHEN glass plates, coated with a gelatin emulsion containing gum arabic, copper sulphate, potassium iodide and potassium metasilphite, are immersed in a 0.4 per cent. solution of mercuric chloride, the emulsion passes from red and orange to a yellow colour; by exposing such a plate under a negative for two minutes in diffused daylight, a black image on a red ground is produced, which changes, on fixation, to a brownish-black image on a yellowish-grey ground. The same emulsified double salt is obtained by mixing emulsified copper iodide with emulsified mercuric iodide. The compound has the composition CuI, HgI_2 , and is a red substance, turning dark brown on heating, and becoming red again on cooling.—T. F. B.

Silver Oxide and Ammoniacal Mercury Compounds; Sensitiveness — of to Light. Lüppo-Cramer. Eder's Jahrbuch, 1904, 18, 10. Chem.-Zeit., 1904, 28, Rep. 296.

A SILVER oxide emulsion was prepared by emulsifying the precipitate obtained by adding the calculated quantity of ammonia to a cold solution of silver nitrate and gum arabic: the emulsion blackens on gentle warming, owing to reduction. An acid solution of metol blackens it strongly, whether it has been exposed to light or not. No practical application appears possible owing to the rapid reduction of the silver oxide by the gelatin. An emulsion prepared from ammonio-mercuric oxide was found to be very slightly sensitive to light; it also darkens slowly on exposure. The compound $\text{Hg}_2(\text{NH}_2)\text{OI}$, obtained by digesting mercuric iodide with ammonia, could not be obtained pure in the form of emulsion in gum arabic solution; the yellow emulsion obtained by adding ammonia to emulsified mercuric iodide is slightly sensitive to light, and gives, after 10 minutes' exposure under a negative, an image which can be developed with metol and sodium carbonate.—T. F. B.

Silver Bromide; Studies on Unemulsified —. K. Schaum. Eder's Jahrbuch, 1904, 18, 74. Chem.-Zeit., 1904, 28, Rep. 295–296.

THE action of light on layers of silver bromide, obtained by precipitating concentrated silver solutions with a soluble bromide, gives an image which can easily be developed. Most developers produce the image very quickly: good gradation and freedom from fog result from the use of dilute developers. An image which can be developed also results from the action of light on a plate coated with grains of silver bromide separated by an organic medium (e.g. gelatin). The sensitiveness to light of unemulsified silver bromide appears to depend on the nature of the soluble bromide used; unemulsified silver bromide can also be "ripened" in the usual manner, and also exhibits "solarisation," showing that this is due, in ordinary emulsions, to an actual change in the silver bromide. Solarisation is completely prevented by immersion for 22 hours in a 5 per cent. solution of ammonium persulphate. Unemulsified silver

bromide is also sensitive to Röntgen rays, and exhibits solarisation under their influence after 80 minutes' exposure.

—T. F. B.

Development for the Production of Images of Fine Grain; Process of —. A. and L. Lumière and A. Seyewetz. Brit. J. Phot., 1904, 51, 866—867.

Two conditions are found to be necessary for producing images of fine grain, viz., slow development (effected either by dilution of the developer or by addition of "restrainers") and the presence of some solvent of silver bromide in the developer: the addition of ammonium chloride (15—20 grms.) to the developer (100 cc.) is found to fulfil both these conditions. In this process, the dissolved silver bromide is reduced by the developer, and the silver is deposited on the image, thus causing physical as well as chemical development. Two developers—viz., *p*-phenylenediamine and *o*-aminophenol—do not require the addition of a substance such as ammonium chloride, since they themselves have a slight solvent action on silver bromide. A suitable developer may be made by dissolving one grm. of *p*-phenylenediamine and six grms. of anhydrous sodium sulphite in 100 cc. of water; this is especially suited for obtaining negatives intended for enlarging, since it gives images of fine grain and normal intensity, and free from fog, on "rapid" plates. With slow emulsions the deposits obtained are of a fine brownish-violet colour especially adapted to transparency work.—T. F. B.

Silver Grain in Photography; Influence of Concentration of the Developer, and Time of Development, on the Size and Character of the —. R. J. Wallace. Astrophys. J.; through Brit. J. Phot., 1904, 51, 865—866.

THREE equally exposed plates were treated with developers of varying concentration, and squares of equal opacity from each negative were examined microscopically. That developed slowly, with dilute "rodinal," exhibited an irregular appearance, the grains having grouped together and giving a "coarse" result. By more rapid development with quinol, the irregularity was quite apparent, but less marked than in the previous case. The most uniform result was obtained by rapid development with a mixture of quinol, "metol" and "aduril"; the grains of silver in this case only exhibited very little grouping. The actual size of the particles was also found to be considerably increased by prolonged development. Similar experiments were carried out on unexposed plates, with the result that the grains of reduced silver became larger and more numerous as the development was continued. Lumière and Seyewetz obtained results in contradiction of the above (see this J., 1904, 799), but the chief reason is considered to be that they examined the actual particles of silver, abstracted from the emulsion, and not the groups of particles as present in the developed negative.—T. F. B.

ENGLISH PATENTS.

Silver Emulsions for use in Photography; Process for the Production of —. J. Gaedicke, Berlin. Eng. Pat. 18,188, Aug. 22, 1904.

HIGHLY sensitive emulsions of very fine grain, and of which the sensitiveness does not diminish on keeping, are produced in the following manner: an unripened gelatin emulsion is well washed, and mixed with about 20 times its weight of water; it is then heated to 40° C. with, for each litre, 1—5 c.c. of ammonia, or other substance having a maturing effect. The heating is continued for one to four hours, according to the degree of sensitiveness desired, and the ammonia in the emulsion is neutralised by addition of the calculated quantity of acid (sulphuric and citric acids are suitable), when the emulsion is ready for use.—T. F. B.

Photographic Paper and the like; Method of Production of —. P. von Gerainow - Trauttenberg and M. L. Fabian, Brünn, Austria. Eng. Pat. 18,890, Sept. 1, 1904.

ACCORDING to this invention, paper is sensitised by a substance, without employing any emulsion.

"Direct copying" paper is prepared by immersing paper in a 5—10 per cent. solution of silver nitrate, drying, and toughening in a solution of oxalic acid 25 grms., citric acid 5—50 grms. (according to the desired hardness) in water, 1 litre. "Contact" paper is produced by treating paper first in a 2·5—5 per cent. solution of silver nitrate, and then in a 2—10 per cent. solution of oxalic acid. Negative paper is prepared in the same way as "contact" paper, except that it is further saturated with castor oil, &c., to render it translucent.—T. F. B.

FRENCH PATENTS.

Casein Emulsion [for Photography]. Soc. Protalbin-Werke Aktienges. Fr. Pat. 343,263, May 18, 1904.

CASEIN (50 kilos.) is agitated with N/1 sodium carbonate solution (500 litres), to a homogeneous mixture, which is filtered, then treated with concentrated acetic acid and allowed to stand several hours. The solid is separated, washed with cold water till nearly neutral, and allowed to stand under water some days, until a test sample is found to be soluble in dilute alcoholic solution of citric acid, when it is placed in a centrifugal machine and dried. This prepared casein is soluble in alkalis, alcoholic solution of acids and hydrated acids, and when mixed with the sensitising salts forms an emulsion without precipitation. Alum or formaldehyde may be added to increase the strength; soap, glycerin, or castor oil to add suppleness, and gelatin or colouring matters if desired.—R. L. J.

Manganic Salts; Process for Preparing Stable Solutions of — [for Photographic Purposes]. O. Gros. Fr. Pat. 343,547, May 30, 1904. Under Internat. Conv. Aug. 22, 1903.

THE higher oxides of manganese, or compounds which, during the reaction, give rise to these, are treated with polyvalent organic acids, which also contain hydroxyl groups (e.g., tartaric acid), or their salts. The solutions thus obtained are rendered quite stable by making them alkaline. For example, excess of tartaric acid is added to a solution of potassium permanganate, and the resulting solution is rendered just alkaline with sodium hydroxide; or the maximum quantity of the precipitate obtained by adding potassium permanganate solution to a solution of manganous sulphate, is dissolved in a saturated solution of sodium tartrate. Such solutions are especially applicable as oxidising agents in preparing photographs by the "cattype" process (see this J., 1903, 330, 963, and 1015).

—T. F. B.

Silver [Photographic] Pictures; Process for converting — into more Stable Catalytic Pictures. O. Gros. Fr. Pat. 343,583, May 31, 1904. Under Internat. Conv. Aug. 22, 1903.

SINCE "silver prints," when used for the "cattype" process, are rendered more or less useless for the purpose after a time, owing to the action of the hydrogen peroxide, particularly in presence of traces of acid, it is desirable to use some more stable form of print. It is found that silver prints can be rendered stable for this process by treating them with a solution of a manganic salt (see preceding abstract) to which potassium ferricyanide has been added; the prints are finished by immersion in an alkaline solution of potassium ferricyanide and washing. If these prints should lose their catalytic properties after a time, they can easily be "regenerated" by subjecting them to the action of ammonia.—T. F. B.

XXII.—EXPLOSIVES, MATCHES, Etc.

Explosives in Coal Mines Order. A. Akers-Douglas, one of H.M. Principal Secretaries of State, Sept. 6, 1904.

THE following have been added to the list of "Permitted Explosives":—

Colliery Cheddite.—Potassium chlorate (76·5—79·5 parts), mononitronaphthalene (14·5—15·5 parts), dinitrotoluene (1·5—2·5 parts), castor oil (4·5—5·5 parts), and moisture (0—1 part).

Nobel Ammonia Powder No. 1.—Ammonium nitrate (82—86 parts), nitroglycerin (7—9 parts), wood meal (6—8 parts), and moisture (0.5—2 parts).

Nobel Ammonia Powder No. 2.—Ammonium nitrate (78—82 parts), nitroglycerin (9—11 parts), wood meal (8—10 parts), and moisture (0.5—2.5 parts).

Phoenix Powder.—Nitroglycerin (28—31 parts), nitro-cotton (0—1 part), potassium nitrate (30—34 parts), wood meal (33—37 parts), and moisture (2—6 parts).

Ammonal B.—Ammonium nitrate (94—96 parts), metallic aluminium (2.5—3.5 parts), charcoal (2—3 parts), and moisture (0—1 part).

Cellite.—Nitroglycerin (56—59 parts), nitrocotton (2.0—3.5 parts), potassium nitrate (17—21 parts), wood meal (8—9 parts), ammonium oxalate (11—13 part.), and moisture (0.5—1.5 parts).—G. W. McD.

ENGLISH PATENT.

Explosives [Perchlorate]. M. E. A. C. Yonck, Namur, Belgium. Eng. Pat. 24,511, Nov. 11, 1903.

The explosives have the following composition:—

—	1.	2.	3.	4.	5.
Ammonium perchlorate	51.2	37.4	47.7	53.24	48.4
Sodium nitrate	37.3	27.17	..	..	..
Ammonium nitrate .....	..	8.34	..	..	..
Naphthalene	11.5	..	..	..	..
Trinitronaphthalene .....	..	27.09	..	14.46	..
Sodium oxalate .....	..	..	27.3	..	..
Ammonium picrate .....	..	..	25.0	..	..
Ammonium oxalate .....	..	..	..	32.3	..
Calcium oxalate .....	..	..	..	..	33.8
Trinitrotoluene .....	..	..	..	..	17.8

Neither free chlorine nor hydrochloric acid are produced upon explosion, and these explosives can be safely used in fiery mines.—G. W. McD.

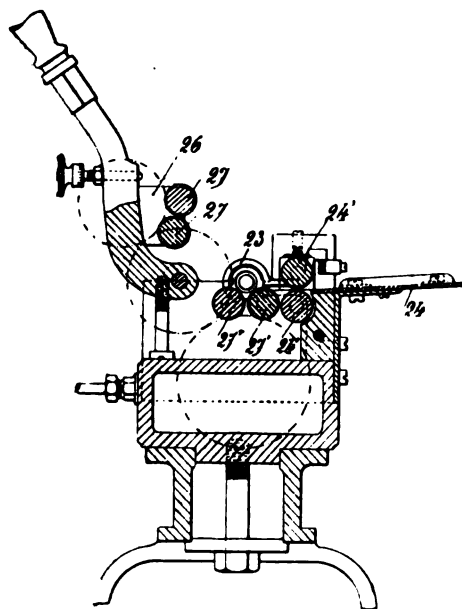
FRENCH PATENTS.

Nitroglycerin; Process for Preparing — R. Möller. Fr. Pat. 343,760, June 6, 1904.

See Eng. Pat. 13,562 of 1904; this J., 1904, 882.—T. F. B.

Powder; Automatic Machine to roll Charges of — Soc. de la Poudre Peigne et des Brevets. J. Luciani. Fr. Pat. 343,242, May 17, 1904.

By means of a system of six rollers geared together, sheets of powder are first rolled into cylinders of fairly large



diameter. The distance between the rollers is then gradually reduced to produce cylinders of the desired diameter tightly compressed. The powder sheet passes through the guides (24) to the drawing rollers (24'), which carry it round the forming rings (23), thus producing the loose cylinder of large diameter. By bringing the rollers (27 and 27') together by means of the handle, the compressed cylinder is produced. The rollers are recessed at a point opposite the forming rings.—G. W. McD.

XXIII.—ANALYTICAL CHEMISTRY.

APPARATUS, ETC.

Condenser and Distilling Column for Distillation in Vacuo, or under Normal Pressure; New — H. Vigreux. Bull. Soc. Chim., 1904, 31, 1116—1119.

The inner tube of the condensers, which is about 22 mm. in diameter, is indented at a number of places, these indentations forming points in the interior of the tube (see Fig. 1);

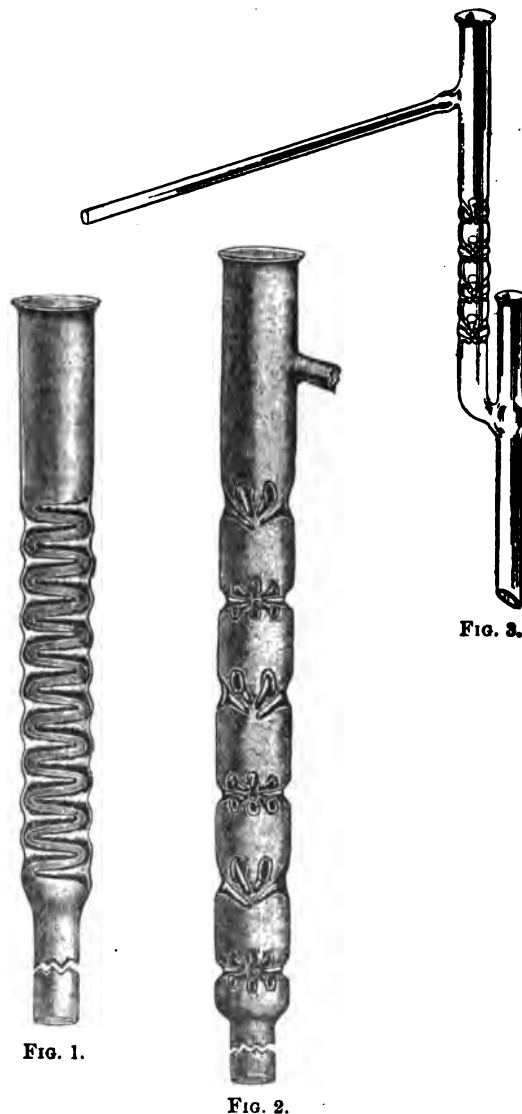


FIG. 1.

FIG. 2.

FIG. 3.

as these points are hollow, thus allowing water to fill them, very efficient condensation is obtained. The rectifying column is made on the same principle; the points are

disposed in a number of horizontal planes round the interior of the tube, the sets of points being alternately horizontal and inclined downwards, thus forming a number of plates and inverted cones; as the drops of liquid fall from the cones, they are caught on the horizontal points before falling back into the liquid; the series of horizontal points thus play the same part as the platinum cones in the Le Bel columns (see Fig. 2). For distillation *in vacuo*, the column takes the form shown in Fig. 3, the projections not being so numerous as in the other forms. The side tube serves to hold a capillary tube for admitting air to the flask when necessary.—T. F. B.

INORGANIC—QUANTITATIVE.

Potassium as Picramate; Determination of —; also Dinitro-aminophenol (Picramic Acid): New Method of Preparation. A Frébault and J. Aloy. *J. Pharm. Chim.*, 1904, 20, 245–247.

Preparation.—Zinc dust and solution of ammonia are added to a warm solution of picric acid in water or methyl alcohol, so as to obtain a distinct alkaline reaction. The mixture is boiled for an hour, with occasional addition of more ammonia. The boiling solution is filtered, excess of ammonia driven off by evaporation on the water-bath, and a slight excess of acetic acid added. Evaporation is then carried to dryness, the residue is redissolved in boiling water, filtered, and crystallised. Fine red crystals of picramic acid, m. pt. 165° C., are thus obtained.

Unrecorded Properties.—Picramic acid burns, but does not detonate, when suddenly heated. It does not precipitate albumin, albumoses, peptone, or alkaloids. Its alkali salts give solutions having a deep red colour, which becomes yellowish-green in the presence of acids. They are therefore available as indicators in alkalimetry.

Rapid Determination of Potassium as Picramate.—Potassium may be precipitated as picrate, converted into picramate, and its amount approximately determined colorimetrically as follows:—A few c.c. of the dilute solution containing potassium salts are treated with an equal volume of alcohol and precipitated with excess of sodium picrate. The potassium picrate is collected, washed with strong alcohol, dissolved in boiling water and converted into picramate by means of dextrose and ammonium carbonate. The colour is then matched with a standard solution of potassium picramate of known strength.

—J. O. B.

Selenium and Tellurium; Use of Phosphorous Acid in the Quantitative Determination of —. A. Gutbier. *Z. anorg. Chem.*, 1904, 41, 448–451.

Compounds in which selenium and tellurium occur in the hexavalent condition, e.g., selenic and telluric acids, are attacked with difficulty by phosphorous acid, and are not completely reduced. In the case of selenious and tellurous acids, however, reduction is effected rapidly and quantitatively by means of phosphorous acid. The best results are obtained by using a hydrochloric acid solution, and boiling after the addition of the phosphorous acid. In neutral and alkaline solutions, the reduced metal remains dissolved in the colloidal condition, but a precipitate is produced on acidifying with hydrochloric acid.—A. S.

Active Oxygen in Organic Persulphates; Quantitative Determination of —. A. Wolff and R. Wolffstein. *Ber.*, 1904, 37, 3218–3214.

The organic persulphate is treated in an Erlenmeyer flask furnished with a Bunsen valve, with hydrochloric acid and a cold saturated solution of sulphurous acid, which has been previously treated with barium chloride solution, and filtered. The reaction proceeds according to the equation: $\text{H}_2\text{S}_2\text{O}_8 + \text{SO}_2 + 2\text{H}_2\text{O} = 3\text{H}_2\text{SO}_4$. The flask is heated till the excess of sulphur dioxide is expelled, the contents are then cooled and filtered, and the barium sulphate washed, dried, and weighed. Accurate results were obtained in test determinations with quinoline, quinaldine, acridine, and quinine persulphates.—A. S.

Chromium and Iron [in Ores and Alloys]; Volumetric Determination of —. K. Glasmann. *Z. anal. Chem.*, 1904, 43, 506–508.

The solution containing a mixture of ferric and chromic salts (but not more than 0.05 grm. of chromic oxide on account of its colour) is treated in a flask, provided with a Bunsen's valve, with sulphurous acid, which reduces the ferric salt, leaving the chromic salt unaltered. The excess of sulphur dioxide is expelled by boiling, accompanied by the passage of a current of carbon dioxide, and the ferrous solution after cooling is titrated with permanganate. The oxidised solution is again reduced by heating with sulphuric acid and zinc according to Zimmermann's method, until it assumes an azure-blue colour. The ferrous and chromous salts are then again titrated with permanganate, the percentage of chromium being calculated from the difference between the two titrations.—J. F. B.

Fluorine in Wine and Beers; Determination of —. F. P. Treadwell and A. A. Koch. *Z. anal. Chem.*, 1904, 43, 469–506.

The quantitative determination of fluorine, even in pure solution, in quantities of 5 mgrms. and less, is accompanied by serious errors; for larger quantities, a correction of 1.5 mgrms. of calcium fluoride may be added for every 100 c.c. of solution and washings to compensate for solubility. By Brand's qualitative etching test, a quantity of 0.5 mgrm. of fluorine in 100 c.c. of wine or beer can be detected with certainty.

Determination of Fluorine in Wine.—The authors advocate the following modification of Rose's method:—100 c.c. of wine are introduced into a 250 c.c. flask and made slightly alkaline with pure 2N-caustic soda solution; silver nitrate is added so long as a precipitate is formed and the liquid is shaken, made up to the mark and filtered. The first 5–10 c.c. of the filtrate having been discarded, 200 c.c. are measured into a 250 c.c. flask, sufficient sodium chloride is added, and the solution is diluted to 250 c.c. It is allowed to remain for 12–24 hours, the clear liquid is decanted off, filtered if necessary, and 175 c.c. (equal to 56 c.c. of wine) of the clear solution are boiled with 2–4 c.c. of 2N-sodium carbonate solution and precipitated with a large excess of calcium chloride, ebullition being subsequently continued for 5 minutes. The precipitate is filtered off, washed with hot water and dried. It is then incinerated and ignited at a dull-red heat for 10–20 minutes. The calcium salts are treated in the crucible with 2–4 c.c. of 1.5 N-acetic acid, and subsequently digested on the water-bath for 40 minutes. The liquid is then evaporated to dryness, the residue is moistened with two drops of acetic acid, extracted with water, and washed by decantation through a small filter. After drying, the precipitate is returned to the crucible, the ash of the filter is added and the fluoride ignited for a few minutes. The extraction with acetic acid and subsequent operations are repeated until the further decrease in the weight of the calcium fluoride does not exceed 0.5 mgrm.

Determination of Fluorine in Beer.—The above method is not applicable in the case of beer, and the authors know of no more exact method than is afforded by a modification of Penfield's process, which, however, only yields about 94 per cent. of the total fluorine present. 100 c.c. of beer are made alkaline with caustic potash, 2 c.c. of 2N-sodium carbonate are added, and the solution is precipitated with excess of calcium chloride at the boiling temperature. This precipitate always retains organic matter and must be ignited, and it is during this process that a large and somewhat variable loss of fluorine is liable to occur. The grey, calcined mass is mixed with 1.5 grm. of calcined quartz in an agate mortar, and is introduced together with 1.5 grm. of sea-sand into the Penfield apparatus, and there decomposed by sulphuric acid.—J. F. B.

Arsenic in "Reduced Iron"; Determination of —. C. A. Hill and J. C. Umney. *Pharm. J.*, 1904, 73, 500–501.

Both the tests recommended by Dunstan (see this J., 1904, 999) and the German Pharmacopœia method are considered

quite accurate for determining arsenic in "reduced iron." The test of the U.S. Pharmacopœia is stated to be inaccurate, as the addition of the iron to hydrochloric acid in the absence of an oxidising agent causes evolution of hydrogen arsenide. The following test is recommended as the best to use: 0.1 gm. of potassium chlorate, and 1 c.c. of hydrochloric acid are added to 0.1 gm. of the reduced iron, and the mixture is warmed until the evolution of gas has ceased; 11 c.c. of hydrochloric acid, 7 c.c. of water, 2 grms. of potassium metasilphate, and 4 grms. of ferrous sulphate are now added and the mixture is heated on a water bath, under reflux condenser, for an hour, after which it is distilled; bromine is added to the first 17 c.c. of the distillate until a distinct coloration remains, and then the solution is decolorised with a solution of hydroxylamine hydrochloride. The arsenic, which is now present in the solution as arsenous acid, can be determined by any standard method. As to the limit of arsenic which should be allowed in "reduced iron," the suggestion of Dunstan (60 parts per million) is considered impracticable, and the matter is thought to call for further careful consideration.

—T. F. B.

Zinc Salts; Study of Complex — F. Kauschert.
XII., page 1032.

Sulphurous Acid in Molasses; Determination of — E. Pozzi-Escot. Bull. Assoc. Chim. Sucr. Dist., 1904, 22, 231.

As the determination of sulphurous acid in molasses by direct oxidation with iodine in the presence of starch paste is not very exact, the author uses the following method which gives more accurate results: 500 c.c. of molasses rendered somewhat fluid with boiling water or 100 c.c. of wort, are introduced into a short-necked flask, a fragment (1 or 2 grms.) of chalk or marble added, and a few c.c. of hydrochloric acid. The flask is then connected to a condenser, and its contents boiled, the evolved sulphurous acid being received in an excess of iodine or bromine. When the distillation is finished, the distillate is heated to 90° C., acidified with hydrochloric acid, and precipitated with barium chloride. —L. J. de W.

ORGANIC—QUALITATIVE.

Indophenine Reaction. F. W. Bauer. Ber., 1904, 37, 3128—3130.

In a former communication, the author stated that the indophenine reaction is not given by benzene containing thiophen, if chemically pure sulphuric acid be used (this J., 1904, 563) unless oxidising agents, such as ferric chloride or nitric acid be added. Storoh (this J., 1904, 730) replied that the effect of the oxidising agents seemed to be entirely due to the heat evolved by them, and that the same effect could be produced by adding water, or by simply warming; whilst Liebermann and Pleus (this J., 1904, 765) deny the author's assertion. The author adheres to his first statement and does not find that warming, or adding water, promotes the reaction. —E. F.

Rosaniline and Pararosaniline; Method of rapidly Distinguishing between — R. Lambrecht and H. Weil. Ber. 37, 1904, 3031.

COMMERCIAL rosaniline dissolves completely in 20 volumes of about 30 per cent. hydrochloric acid on warming. On cooling and standing, even for days, no precipitate is formed, whereas pararosaniline is almost completely precipitated under the same conditions in the form of a slightly soluble hydrochloride. —E. F.

ORGANIC—QUANTITATIVE.

Methylene Blue; Volumetric Determination of — L. Pelet and V. Garuti. Bull. Soc. Chem., 1904, 31, 1094—1097.

THIS method depends on the formation of insoluble lakes by Methylene Blue with certain acid dyestuffs, an aqueous solution of which was run from a burette into an aqueous solution of Methylene Blue, until a drop of the solution,

placed on unsized paper, showed that the dyestuff had been completely precipitated. It was necessary to use an acid dyestuff the aqueous solution of which was highly coloured, and which gave an insoluble lake: Ponceau, Carmine, Pyramine Orange, and Cotton Brown were all found to give good results; of these the authors recommend Ponceau as giving the most accurate results, as well as being very simple in use. One mol. of the Ponceau combines with 2 mols. of Methylene Blue. It was also found possible to determine the amount of Ponceau present by titration with a solution of Methylene Blue; in this case it was noticed that no lake formation commenced until one mol. of Methylene Blue had been added to the Ponceau solution. —T. F. B.

Sugar in Molasses and Cane Sugar Factory Products; Determination of Crystallisable and Reducing — H. Pellet. Bull. Assoc. Chim. Sucr. et Dist., 1904, 22, 145—160.

THE author states that normal lead acetate is the proper defecant for cane sugar products, but as it exerts only a slight decolorising action, sodium hypochlorite should be used with it to obtain solutions sufficiently decolorised for inversion and polarisation by the Clerget method. The polarisation is higher when basic lead acetate is used, except in some cases where molasses of light gravity (75°—78° apparent Brix) has been kept for some time, and the reducing sugars have become modified, and the sucrose transformed. It is essential to determine the water directly by desiccation in order to find the real purity, from which the apparent purity of molasses may differ by 7 to 13.5 per cent. In the determination of the reducing bodies of products of cane sugar factories, no defecating reagent should be used. In case the quantity of lime present is injurious, it may be precipitated by sodium carbonate, avoiding excess.

Bibliography.—(1) *Comptes rend.*, 1875, 181; (2) Note on the determination of crystallisable sugar in presence of dextrose, *Comptes rend.*, 1880, 303; (3) *J. Fabr. Sucre*, Jan. 26, 1877; (4) No. 30, 1877, and determination of crystallisable sugar in presence of pure dextrose, No. 27, 1877; (5) 1879, Nos. 15 and 21; (6) 1883, No. 35 (analysis of cane molasses); (7) 1886, No. 20; (8) 1889, No. 16; (9) 1891, No. 13; (10) Bull. Assoc. Chim. Sucr. et Dist.; (11) On the determination of sugars, 1883, 176; (12) Analysis of molasses, 1890—1891, 439, 550, 615, 623; (13) On the determination of crystallisable sugar in presence of dextrose in cane molasses, 1895—1896, 836; (14) Experiments on the fermentation of cane molasses, &c. (with Barbet), 1895—1896, 948; (15) On the determination of invert sugar in presence of various reducing bodies, 1896—1897, 145; (16) On the determination of invert sugar, and reducing bodies in beetroot molasses, 1896—1897, 338; (17) Study of the reducing sugars of the cane, 1897—1898, 233; (18) 1897—1898, 293—299 (this J., 1897, 250, 1027); (19) Analysis of the molasses of beetroot and cane sugar factories, 1897—1898, 520, 605, 705, 793, 920 and 1120 (this J., 1898, 187, 498); (20) Analysis of cane molasses, 1898—1899, 1006, 1145; (21) 1899—1900, 52, 55, 62, 64, 65 (this J., 1899, 775); (22) Determination of reducing bodies in presence of sucrose, 1899—1900, 699; (23) Action of basic and normal lead acetate on reducing bodies, 1899—1900, 55; (24) Studies of the molasses of cane sugar factories, 1901—1902, 830 (this J., 1902, 428); (25) Nature of the reducing sugar of the cane, 1901—1902, 834 (this J., 1902, 416). —L. J. de W.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Carbon Dioxide in Seeds during Germination; Origin of — E. Urbain. *Comptes rend.*, 1904, 139, 606—608.

CONNSTERN, Hoyer, and Wartenberg (this J., 1902, 1541), noticed that when castor seeds were treated with a 1 per cent. solution of chloral hydrate, no hydrolysis of the fats occurred until after some days. That this sapnification is not due to atmospheric carbon dioxide, or to that formed by oxidation by atmospheric oxygen, is shown by the fact that it occurs equally well in the absence of air.

The following experiments show that the carbon dioxide is the result of decomposition of the albuminoid matter by the proteolytic enzymes present in castor seeds. Castor oil treated with cytoplasm (prepared from the seeds by the method of Nicloux (this J., 1904, 687) and chloral hydrate solution, *in vacuo*, showed practically no acidity after eight days; whilst, when aleurone (prepared by the same method) was added to the other substances, almost complete saponification of the fatty acids occurred after eight days. It would thus seem that this proteolytic decomposition was the first phase of germination, preceding the lipolytic action.

—T. F. B.

India-Rubber; Action of Radium Rays on — R. Dittmar. *Gummi-Zeit.*, 1904, 19, 3—4.

EXPERIMENTS with a weak radium-barium bromide preparation (10,000 times as strong as uranium pitchblende) showed that the γ -rays pass through both raw and vulcanised rubber, but through the former more readily than through the latter. Rubber which has been made radio-active by induction behaves differently from other solid bodies in a similar condition. In general, the induced radio-activity is dissipated to the extent of one-half in 28 minutes, when the substance is exposed to the air. In the case of rubber, however, the radio-activity persists for from 15—20 days.—J. K. B.

New Books.

MONOGRAPHS ON APPLIED ELECTROCHEMISTRY. ELEKTROLYTISCHES VERFAHREN ZUR HERSTELLUNG PARABOLISCHER SPIEGEL. VON SHEPARD COWPER-COLES. Ins Deutsche übertragen von Dr. EMIL ABEL. 1904. Price M. 1.

PAMPHLET, 8vo size, containing 17 pages of subject-matter, with 13 illustrations. The leading themes are the following:—

THE PROCESS OF COWPER-COLES.—Preparation of the Glass Mould. Silvering the Mould. Description of the Electrolytic Bath. Raising the Mirror from the Mould, &c. PROPERTIES OF THE METALLIC MIRROR.—Reflective power of Palladium and other Metals. Weight of the Metallic Mirror, its Hardness, and Optical Tests. Improvement of the Surface of the Mirror.

ARTIFICIAL GRAPHITE. By FRANCIS A. J. FITZ-GERALD. Ins Deutsche übertragen von Dr. MAX HUTH. Verlag von Wilhelm Knapp, Halle a. S. 1904. Price M. 3.

PAMPHLET like the foregoing, and containing 58 pages of subject-matter, one page of bibliographic notes, and an alphabetical index of authors. The text is illustrated with 14 wood-engravings and five tables. I. Historic Survey. II. Methods of Preparation: A. Castner's Anode for Electrolytic Processes. B. Process of Girard and Street. C. Process of Acheson. D. Process of Rudolph and Hörden.

UEBER HERKOMMEN UND CHEMIE DES KAUSCHUKS. VON Dr. ED. MARCKWALD und Dr. FRITZ FRANK. Steinkopff und Springer, Dresden, A. 21. 1904. Price M. 1.50.

PAMPHLET of 8vo size, containing 68 pages of subject-matter.

SMOKE PREVENTION AND FUEL ECONOMY. (Based on the German Work of E. Schmatolla.) By WM. H. BOOTH and JOHN B. C. KERSHAW. A. Constable and Co., Ltd., 16, James Street, Haymarket, London. 1904. Price 6s.

8vo volume, containing 188 pages of subject-matter, with 75 illustrations, and an alphabetical index. The subject is subdivided into and treated under the following heads:—I. The Chemistry of the Combustion Process. II. Present Methods of Burning Fuels, and their defects. III. Improved Methods of Burning Fuel. IV. The Examination of the Waste Gases, and Control of the Combustion Process. The Appendix is a considerable one, and is subdivided into: 1. Patent Abstracts, English, German, and U.S.A. II. Fuel Analyses, Losses and Costs. III. Miscellaneous Extracts.

A SCHEME FOR THE DETECTION OF THE MORE COMMON CLASSES OF CARBON COMPOUNDS. By FRANK E. WESTON, B.Sc. Longmans, Green, and Co., 39, Paternoster Row, London; New York and Bombay. 1904. Price 2s.

8vo volume, containing 56 pages of subject-matter and eight illustrations. The methods apply under the following conditions:—I. Carbon and Hydrogen only present. II. Carbon, Hydrogen, and Halogen present. III. Carbon, Hydrogen, Oxygen, and Halogen present. IV. Carbon, Hydrogen, and Oxygen present. V. Carbon, Hydrogen, and Nitrogen present. VI. Carbon, Hydrogen, Nitrogen, and Oxygen present. VII. Carbon, Hydrogen, and Sulphur present. VIII. Carbon, Hydrogen, Sulphur, and Oxygen present. IX. Carbon, Hydrogen, Sulphur, and Nitrogen present. X. Carbon, Hydrogen, Sulphur, Oxygen, and Nitrogen, or Halogen present. XI. Special Reactions. XII. Solubility of Carbon Compounds.

ST. LOUIS EXHIBITION, 1904. GERMAN EDUCATIONAL EXHIBITION. CHEMISTRY. W. BÜCKENSTEIN, Berlin. 1904. A. Asher and Co., 13, Bedford Street, Covent Garden, London, W.C. Price 2s.

8vo volume, containing preface and 135 pages of subject-matter, followed by indexes of names and subjects. In this descriptive catalogue the contents or characters of the different rooms are found given as follows:—I. Reading-room. II. Alchemistic Laboratory. III. The Liebig Laboratory. IV. General and Inorganic Chemistry. V. Pyrochemistry. VI. Scales and Balances. VII. Electrochemistry. VIII. Organic Chemistry. IX. Dyeing Laboratory. X. Shaking Apparatus and Bomb-tube Experiments. XI. Physiological and Fermentation Chemistry.

Trade Report.

I.—GENERAL.

AUSTRALIAN IMPORTS IN 1903.

Pharm. J., Oct. 29, 1904.

Although the Commonwealth official statistics have not been issued, figures have been published which show that Great Britain still retains her lead as principal exporter to Australia. The imports into the Federal States for 1903 run out at 36,551,542*l.*, and the exports at 29,046,206*l.* Adding exports and imports of specie and bullion, the total comes out at 85,981,025*l.*, an increase of nearly one and a half millions over 1902. The figures (which are extracted from *Commercial Intelligence*) for certain articles are as follows:—

	Great Britain.	France.	Germany.	U.S.A.
	£	£	£	£
Boric, salicylic, and other acids.....	5,363	14	565	13
Aerated and mineral waters.....	5,162	28	4,981	407
Alkalis.....	73,639	29	126	1,909
Alum.....	626	..	54	..
Ammonium carbonate....	2,044	..	10	6
Drugs and chemicals....	315,285	98,510	47,321	4,981
Dyes.....	18,175	7,106	2,878	5,261
Filters.....	2,341	94	15,000	252
Instruments, scientific..	17,628	255	2,416	1,594
Medicines.....	133,613	562	2,682	81,698
Perfumery.....	32,263	2,881	3,749	10,363
Photographic goods.....	51,630	83	858	344
Varnishes.....	42,051	22	381	4,590

France heads the list for tartaric acid and cream of tartar, but these represent her only success. Germany, on the other hand, leads with several commodities, the only one of chemical interest being calcium carbide.

NATAL; TRADE OF — WITH THE UNITED KINGDOM.

Bd. of Trade J., Oct. 27, 1904.

The following figures are given, as supplementing those given in this J., 1904, 630, showing the value of certain British goods imported into Natal during 1903:—Ale and beer, 43,700*l.*; apothecary ware, 74,400*l.*; candles, 46,000*l.*; cement, 26,100*l.*; earthenware, 59,100*l.*; glass and glassware, 68,500*l.*; malt, 24,300*l.*; milk, condensed, 105,900*l.*; oils, other than paraffin and linseed, 32,000*l.*; painters' colours, 53,600*l.*; paper, printing, 81,000*l.*; paper, wrapping and brown, 7000*l.*; perfumery, 12,000*l.*; soap, 73,500*l.*; spirits, 224,700*l.*

II.—FUEL, GAS, AND LIGHT.

COAL PRODUCTION OF THE WORLD.

Eng. and Mining J., Oct. 13, 1904.

The world's production of coal and lignite in 1903 amounted to 877,755,053 metric tons, compared with 804,405,298 tons in 1902 and 787,179,967 tons in 1901. This great increase in coal output shows, as no other one factor, how rapidly industrial activity advanced in the years named. The United States easily led the world in developing fuel resources, in spite of the reduced anthracite production of Pennsylvania in 1902, owing to the long strike of the miners. The long-developed fields of Great Britain made a substantial gain in 1902 and 1903, and in 1903, Germany, France, and Belgium increased their production. In fact, four of the five leading coal-producing countries in 1903 surpassed all previous records of output. The figures for the three years are as follows, in metric tons:—

	1901.	1902.	1903.
	Met. Tons.	Met. Tons.	Met. Tons.
United States.....	266,078,968	273,000,961	328,064,592
United Kingdom.....	212,614,981	230,728,563	234,009,494
Germany.....	162,623,931	150,600,214	162,619,834
Austria-Hungary.....	40,746,704	39,386,884	39,600,000
France.....	32,325,803	19,997,470	35,002,892

The stationary position of Austria-Hungary has been caused by labour difficulties and industrial depression.

In the other European countries, in Canada, in South Africa and in Australia, production increased during 1903, and some of the smaller countries, not reporting outputs, such as Mexico, made substantial gains. In fact, the activity of coal mines was a feature of the world's work in 1903.

III.—TAR PRODUCTS, PETROLEUM, Etc.

PETROLEUM PRODUCTION OF THE UNITED STATES IN 1903.

Bd. of Trade J., Oct. 27, 1904.

The annual report of the United States Geological Survey on the production of petroleum in the United States in 1903, states that the output reached the large total of 100,461,837 barrels, being larger than that of any previous year, and greater than that of 1902 by 11,694,421 barrels, or 13.17 per cent. The greatest part of the increase during 1903 was from the State of California, which produced in that year nearly one-fourth of the entire production. The total value of the oil produced in 1903 was 94,694,050 *dols.*, as compared with 71,178,910 *dols.* in 1902.

VARNISH; BLACK — : U.S. CUSTOMS DECISION.

Aug. 19, 1904.

A mixture of light coal tar oils and coal-tar pitch, drying and forming a coating when exposed to the air, was held to be dutiable at 20 per cent. *ad valorem*, under paragraph 15 of the present tariff, as a "preparation of coal tar, not a colour or dye." The assessment of duty at 35 per cent. *ad valorem*, under paragraph 53, was overruled.—R. W. M.

PETROLEUM IN ROUMANIA; PRODUCTION OF —.

Eng. and Mining J., Oct. 13, 1904.

According to official statistics recently published in the *Petroleum Review*, the output of petroleum in Roumania during the first half of the present year was 213,702 metric tons. The Prabova district, as usual, contributed the greater part of the output. The figures indicate that the industry is growing steadily, and the product for 1904 will probably exceed previous records.

VII.—ACIDS, ALKALIS, Etc.

ARSENIC PRODUCTION IN 1903.

Chem. Trade J., Oct. 29, 1904.

The annual report of the U.S. Geological Survey states that the production of arsenious oxide in the United States during 1903 amounted to 611 short tons, valued at 36,691 *dols.*, as compared with 1853 tons in 1902 and 300 tons in 1901, the last-named year being the date of the inception of the white arsenic industry in the United States. The entire domestic product has been made at the plant of the Puget Sound Reduction Co., Everett, Wash., and the large increase in the domestic production during 1902 promised success to the undertaking. Owing to various commercial reasons, however, the by-product plant was operated at its full capacity only during the first quarter of the year 1903. It was shut down from March until September 1903, when, at the latter time, the works came under the control of the American Smelting and Refining Co. During the last three months of the year, the by-product plant was used only for roasting small quantities of arsenical lead ores, and no white arsenic was shipped to the market.

The arsenic ores treated at this plant consisted mainly of arsenical pyrites containing, on the average, about 14 per cent. of arsenic and 0.7 oz. of gold and 3 oz. of silver per ton. A part of the ore treated contained only 2 per cent. of sulphur, the arsenic being present chiefly in an oxidised form. The by-product plant for the condensation and collection of the white arsenic consists of a long brick flue, 20 ft. high, connecting the Wetthey mechanical six-hearth 60-ton roasting furnace with the dust chamber, which latter is 5 ft. high and covers an area of about 125 to 150 ft. This chamber is built of 4-in. brick walls, and is divided into four equal parts, so arranged that by the use of valves or dampers any one section can be cut out from the other, and the condensation may thus be carried on continuously. The arsenical compounds in the ore are decomposed during the roasting, and are transformed chiefly into volatile arsenious oxide, which passes out with the waste gases of the furnace, and is subsequently condensed by their cooling and lessened velocity, and settles on the floor of the dust chamber or becomes attached to the sides and roof in beautiful festoons of pure white crystals resembling snow. At stated intervals each section is cut out from the system, and the accumulated deposit of white arsenic is shovelled into hand barrows and carried to storage bins until needed for subsequent refining in a small reverberatory furnace. After the arsenic has been expelled by the roasting, the ore is discharged from the furnace and treated with lead ore in a shaft furnace for the extraction of the gold and silver.

Despite the fact that the domestic output of arsenical compounds is not sufficient to supply more than one-quarter of the total consumption of the United States (large quantities being annually imported from Canada, Germany, and Spain), the development of this industry is of exceedingly slow growth. During 1903 there were imported from Canada, England, Germany, and Spain 1,211,299 lb. of arsenious acid, valued at 38,505 *dols.*, and 7,146,362 lb. of arsenic sulphide and orpiment, valued at 256,097 *dols.*, as compared with 1,385,700 lb. of arsenious oxide, valued at 42,424 *dols.*, and 6,725,198 lb. of arsenic sulphide and orpiment, valued at 237,631 *dols.* in 1902.

A recently discovered deposit of arsenic is being exploited at Pilot Mountain, 17 miles from Christiansburg, Montgomery County, Va. The capacity of the plant, when completed, is placed at 140 tons of refined arsenic per month. The region is wild and mountainous.

The white-arsenic plant at Anaconda, Mont., was nearly completed on January 1st, 1904. Large trick settling chambers have been erected alongside of the flue of the Brunton roasting furnaces, in order to condense and collect the arsenical fumes formed during the roasting. The arsenic-refining department has been equipped with suitable reverberatory furnaces, in which the crude flue deposit will be refined and the purified product subsequently ground and packed for the market in air-tight barrels, each of a capacity of 400 lb. The daily capacity of the by-product plant is reported to be several tons of flake arsenic.

An interesting discovery of metallic arsenic was made during 1903 at Washington Camp, Santa Cruz County, Ariz. The deposit is in masses attached to the walls of small pockets in dolomitic limestone. The size of the masses is generally small, although in one instance a piece weighing 20 lb. was found.

The world's production of arsenic in 1903, so far as reported, was as follows:—Canada, 238 tons, value 15,420 dols.; Germany, 2768 tons, value 253,500 dols.; Spain, 1088 tons, value 87,040 dols.; United Kingdom, 917 tons, value not given; United States, 554 tons (611 short tons), value 36,691 dols. A relatively small quantity of arsenic is produced in Italy, Japan, Portugal, and Turkey, but the statistics of these countries are not yet available for 1903.

The significance of the importation of arsenic and its compounds for the manufacturing industries of the United States may be appreciated from the statistics given in the following table for the past five years, showing the imports of metallic arsenic, white arsenic (arsenious acid), and arsenic sulphides (orpiment and realgar):—

Year.	Quantity.	Value.
	Lb.	Dols.
1899	9,040,571	386,791
1900	5,765,559	265,540
1901	6,969,668	316,525
1902	8,110,898	280,055
1903	5,257,661	204,602

LIME; VIENNA —: U.S. CUSTOMS DECISION.

Sept. 26, 1904.

Vienna lime was held to be dutiable at 25 per cent. *ad valorem* under section 6 of the present tariff, as a "manufactured article unenumerated." The assessment of duty at 35 per cent. *ad valorem* as an "article composed of mineral substances," under paragraph 97, was overruled.

—R. W. M.

IX.—BUILDING MATERIALS, Etc.

ASPHALT MASTIC: U.S. CUSTOMS DECISION.

Oct. 18, 1904.

It was decided that asphalt mastic was dutiable at 3 dols. per ton under paragraph 93 of the present tariff, overruling the claim of the importers that it was dutiable at 50 c. per ton as "crude asphalt" under the same paragraph.

—R. W. M.

CLAY MATERIALS; PRODUCTION OF — IN 1903.

Eng. and Mining J., Oct. 13, 1904.

According to the United States Geological Survey, the total value of the various clay products manufactured in the United States last year was 130,962,648 dols. This total was made up of the following items:—Common brick, 50,532,075 dols.; front brick, 5,308,908 dols.; paving brick, 6,453,849 dols.; fancy brick, 892,256 dols.; fire-brick, 14,062,369 dols.; drain-tile, 4,639,214 dols.; sewer pipe, 2,525,369 dols.; terra cotta, 4,672,028 dols.; fireproofing, 8,708,143 dols.; hollow blocks, 1,153,200 dols.; tile other than drain tile, 3,505,929 dols.; pottery, 25,436,052 dols.; miscellaneous, 3,073,856 dols. As compared with the output for 1902, there was an increase of 8,793,117 dols.

X.—METALLURGY.

MINERAL OUTPUT OF CALIFORNIA.

Eng. and Mining J., Sept. 22, 1904.

The mineral production of California during 1903, as compiled from reports made to the State Mining Bureau at San Francisco, is shown in the following table:—

		Quantities.	Value.
Asphalt.....	Tons	41,670	Dols. 503,659
Bituminous rock.....	"	21,944	53,106
Borax, crude.....	"	34,430	661,400
Cement.....	Bbl.	640,868	968,727
Chrome ore.....	Tons	150	2,250
Chrysoprase.....	"	..	500
Clay, brick.....	Million	214,403	1,968,546
Clay, pottery.....	Tons	90,972	90,972
Coal.....	"	93,025	265,353
Copper.....	Lb.	19,113,861	2,880,967
Fuellers' earth.....	Tons	250	4,750
Gold.....	"	..	16,471,394
Granite.....	Cb. ft.	408,625	678,670
Gypsum.....	Tons	6,914	46,441
Infusorial earth.....	"	2,703	16,016
Lead.....	"	55	3,980
Lime and limestone.....	"	..	592,285
Lithia mica.....	Tons	700	27,300
Macadam.....	"	606,115	436,172
Magnetite.....	"	1,361	26,515
Manganese.....	"	1	23
Marble.....	Cb. ft.	84,624	97,354
Mica.....	Tons	50	3,900
Mineral paint.....	"	2,370	3,720
Mineral water.....	Galls.	2,058,340	568,291
Natural gas.....	M. Cb. ft.	120,134	78,237
Paving blocks.....	Million	4,354	134,642
Petroleum.....	Bbl.	24,340,839	7,313,371
Platinum.....	"	..	1,062
Pyrites.....	Tons	24,311	94,000
Quartz crystal.....	"	..	1,908
Quicksilver.....	Flasks	32,094	1,335,951
Rubble.....	Tons	1,610,440	1,237,619
Salt.....	Bbl.	102,895	211,395
Sand.....	Tons	7,725	7,725
Sandstone.....	Cb. ft.	353,092	586,309
Serpentine.....	"	90	800
Silver.....	"	..	517,444
Slate.....	Squares	10,000	70,000
Soapstone.....	Tons	219	10,124
Soda.....	"	18,000	27,000
Tourmaline.....	"	..	100,000
Turquoise.....	"	..	10,000
Total value.....	..	..	57,789,040

In the previous year the mineral production of the State was valued at 35,069,105 dols., showing an increase in 1903 of 2,689,935 dols.

LEAD; THE CANADIAN BOUNTY ON —.

Eng. and Mining J., Oct. 13, 1904.

The text of the Canadian order in council, which permits the application to exported lead ores of any unappropriated portion of the bounty on lead is as follows:—

"Whereas by clause 8 of the Act 3 Edward VII. Chap. 31, intituled, 'An Act to provide for the payment of bounties on lead contained in lead-bearing ores mined in Canada,' it is provided that if at any time it appears to the satisfaction of the Governor-General in Council that the charges for transportation and treatment of lead ores in Canada are excessive, the Governor in Council may authorize the payment of bounty at such reduced rate as he deems just on the lead contained in ores mined in Canada, and exported for treatment abroad, and

"Whereas, it appears that the lead smelters in Canada are unable at present to treat the whole of the lead ores mined in Canada, except at an excessive rate:

"Therefore, the Governor-General in Council is pleased to order that, after the payment of the full amount of bounty payable under the Act above referred to and amendments thereto, upon lead ores mined and smelted in Canada, and dating from the 1st day of April, 1904, until the 30th day of June, 1905, a rate of 50 c. per 100 lb. of lead contained in lead-bearing ores mined in Canada, and exported for treatment to Europe, shall be paid, provided that the quantity of lead upon which such bounty shall be paid

shall not exceed 11,000 tons, of 2000 lb., in any one fiscal year." (See also this J., 1904, 886.)

LEAD IN ONTARIO.

Eng. and Mining J., Oct. 13, 1904.

According to the *Canadian Mining Review*, the existence of ores of lead in Ontario, Quebec, and Nova Scotia has been known for more than 30 years, and various and spasmodic attempts have been made to work these ores. The deposits in Tudor, Ontario, occur in calcareous and micaceous schists, associated with limestones and dolomites of Silurian age. Some of these deposits occur associated with a gangue of barytes and calc spar, and are small in extent; others are from 18 in. to 24 in. in width, the ore appearing in bunches, and as disseminated grains in the gangue. Some larger masses of galena are occasionally found, but the characteristic of the region is a lack of continuity to the deposits.

In both Tudor and Lake townships there appear to be two distinct sets of deposits, one striking north-west, the other north-east, and where two veins cross each other there is usually an enlargement at the surface which does not continue in depth. There are, in addition, other veins, usually with a quartz gangue, which are somewhat larger, and which cut through the gneisses of Elzevir township.

The association of arsenical and antimonial ores with the galenas of this section is not infrequent; their values in silver are low, running from 3 to 8 oz. of silver to the ton of galena, and the majority of samples show no gold whatever.

MINES IN KOREA.

Le Mercure, July 31, 1904. U.S. Cons. Repts., No. 2084, Oct. 18, 1904.

Korea possesses gold mines whose output has increased from 1,158,000 dols. in 1898 to 2,509,000 dols. in 1902. It has also mines of iron, silver, copper, coal, &c. The greater part of the gold is exported to Japan. Iron, although present in large quantities, can hardly be said to be exploited. As a matter of fact, iron used in Japanese foundries comes from China. Coal of medium quality is equally abundant, but it is hardly exploited. Copper is extracted in several districts. During the last two years 564,433 lb., valued at 51,044 dols., were mined.

CHROME ORE SUPPLIES.

Eng. and Mining J., Oct. 6, 1904.

The rapid expansion of the chrome ore industry of New Caledonia recently has begun to have a very noticeable influence upon the general trade conditions. In fact, the competition from this source has become so sharp that some apprehension is felt that it may seriously affect the industry in other countries. So far, the most important result connected with the increased exports from New Caledonia has been a decline in the quotations of about 5 dols. per ton for 50 per cent. ore at New York.

For many years the trade in chrome ore has been practically controlled by the Turkish producers. The exports from this country have averaged 40,000 tons annually, which, up to 1903, about equalled the aggregate output from all other countries. The mines are situated in the European provinces of Salonica, Kosovo, and Monastir, and the Asiatic provinces of Aidin, Konia, Adana, Angora, Broussa, and Macri. Most of the product imported into the United States comes from Macri and Broussa, and is known under the trade names of "Macri" and "Daghardi," the latter being the largest mine in Broussa. The ores contain from 48 to 54 per cent. of Cr_2O_3 ; the Macri ore carries from 48 to 51 per cent., and the Daghardi ore up to 54 per cent. There has been some effort put forth to restrict the output within reasonable bounds, as the resources of the country are very extensive, and could be made to yield much more than the present output. The Turkish government exacts a royalty of 20 per cent. on the value of the ore mined, and also imposes a duty of 1 per cent. on the exports. In spite of this heavy burden, however, the cost of producing the Macri ore and delivering it at the seaboard is said to be only 35s. per ton.

The growing importance of New Caledonia as a producer of chrome ore is well shown by the statistics of exports, which have increased from 1042 metric tons in 1894 to 10,474 tons in 1900, and 21,437 tons in 1903. During the first four months of the present year the shipments amounted to 12,225 metric tons. The chromite is mined principally in the north-western and south-western portions of the island, the mineral occurring in association with serpentine, which also yields the nickel and cobalt ores. Some of the deposits are of great size; as much as 20,000 tons of ore have been taken from a single ore-body. The principal factor in the industry is the Société le Chrome, a combination of producing interests which came into existence in 1902. At present mining is most actively carried on at Tiepaghi, where the ore is especially rich. The Société le Chrome has leased the mining rights on this property to tributaries, who paid the sum of 200,000 dols. for the privilege of working it for three years. It is said that the output for this period may reach 100,000 tons. The ore requires no mechanical concentration, and is shipped in large lots with an average content of 56 per cent. chromic oxide.

Aside from Turkey and New Caledonia, chromite is mined quite extensively in Canada, Newfoundland, Greece, Russia, India, and Australia. The deposits in the United States are of small importance at present, although they occur quite widely among the altered rocks of the Appalachians from Pennsylvania southward, and also in California. In recent years, the output has amounted to only a few hundred tons, most of which was mined in California and consumed locally. As to the other countries, Australia has come into some prominence lately, due to the fact that the ore is high grade and is exported to the United States as ballast in wool-laden ships, thus getting a very low transport rate. Important discoveries of ore have recently been reported from India, and it is now being offered in the American market. The Canadian chromite is obtained from the eastern townships of Quebec. According to J. Obalski, a good deal of development has been done lately, and an increased output may be expected from this region. The production in 1903 amounted to 3020 tons. Newfoundland is known to possess large deposits of concentrating ore, favourably situated as to transport, but so far they have not been very actively exploited.

The consumption of chromite in the United States at present is probably about 30,000 long tons per annum. The imports for the last three years have been as follows: 1901, 20,112 tons; 1902, 39,570 tons; 1903, 22,931 tons. There are three important applications to which the ore is put: the preparation of bichromates and other compounds of chromium, the manufacture of ferro-chromium, and in making linings for blasts and reverberatory furnaces. For the latter purpose it is sometimes used in the form of bricks. The Kalion Chemical Company, of Philadelphia, Pa., controls the manufacturing business in chromium compounds, while the Wilson Aluminium Company, of New York, is the principal manufacturer in this country of ferro-chrome. Chrome bricks are made by the Harbison-Walker Company, of Pittsburg.

PRECIOUS METAL PRODUCTION OF THE UNITED STATES IN 1903.

Eng. and Mining J., Oct. 6, 1904.

The corrected figures for the production of gold and silver in the United States during 1903 (see this J., 1904, 142) are as follows:—

Gold: 3,560,000 fine ounces, valued at 73,591,700 dols., a decrease of 6,408,300 dols., or 8 per cent., as compared with 1902.

Silver: 54,300,000 fine ounces, valued at 29,322,000 dols., an increase of 93,000 dols. over 1903, solely due to the higher average price of the metal.

LEAD PRODUCTION OF UNITED STATES.

Eng. and Mining J., Oct. 13, 1904.

The production of lead in the United States in 1903, from domestic ores, showed a slight decrease from that reported in the previous year. The total, as shown by the

figures furnished for *The Mineral Industry* by producers, was 276,694 short tons, and the decrease from 1902 was 3830 tons, or 1·3 per cent. The decline in production was entirely in desilverized lead, the output of soft lead, chiefly from the Missouri mines, showing a gain of 11 per cent. During part of the year the smelters restricted their purchases of ore, and consequently the production of the metal.

In addition to the lead made from domestic ores, smelters and refineries turned out 92,794 tons of metal from foreign ores and base bullion, making the total lead put into merchantable form, at works in the United States, 369,488 short tons.

In the table below is given a statement of the imports, exports, &c., as shown by the reports of the Bureau of Statistics, the figures being in short tons:—

Foreign Lead in the United States.

Imports.	1902.	1903.
Lead, metallic.....	2,529	3,023
Lead in ores and base bullion.....	105,186	103,384
Total imports.....	107,715	106,407
Less re-exports of foreign.....	78,967	81,915
Less smelters' allowance on lead re-exported.....	7,597	8,192
Total deductions.....	86,564	90,107
Net imports.....	20,351	16,300
Add lead in bond, Jan. 1.....	16,622	23,939
Total supply.....	37,473	40,239
Deduct lead in bond, Dec. 31.....	23,939	10,684
Approximate consumption of foreign.....	13,534	29,545

By far the greater part of the lead imported last year—93,068 tons, or 87·5 per cent. of the total—came from Mexico, the quantity received from Canada having been comparatively small, only 9,600 tons. The Mexican lead comes chiefly in the form of base bullion, to be refined in bond.

The total supplies of lead for the year, and the disposition made of them, are shown in the following table, the figures being in short tons:—

Lead Production and Consumption.

	1902.	1903.
Desilverized.....	199,615	188,943
Soft.....	70,424	78,298
Antimonial.....	10,465	9,453
Total production.....	280,504	276,694
Add stocks, Jan. 1.....	70,316	30,500
Add net foreign.....	13,534	29,545
Net total supplies.....	36,374	336,739
Domestic lead exported.....	3,271	56
Estimated consumption.....	330,603	315,683
Total.....	333,874	315,739

IRON SAND: U.S. CUSTOMS DECISION.

Oct. 17, 1904.

Merchandise invoiced as "chilled iron," "diamond grit," and "steel grit" was assessed for duty at 45 per cent. *ad valorem* as "manufactures of metal" under paragraph 193 of the present tariff. Analysis having shown them to be iron, the claim of the importer that it was "steel," dutiable under paragraph 135, was overruled.—R. W. M.

XII.—FATS, FATTY OILS, Etc.

WOOL GREASE: U.S. CUSTOMS DECISION.

The United States Circuit Court decided the wool grease, highly refined, but dealt in commercially as wool grease, is

nevertheless "wool grease" and dutiable at $\frac{1}{2}$ c. per lb. as such under paragraph 279 of the present tariff. The assessment of duty at 25 per cent. *ad valorem* as "rendered oil" under paragraph 3, was overruled.—R. W. M.

RECOVERED GREASE: U.S. CUSTOMS DECISION.

Aug. 10, 1904.

Grease recovered from wool, and consisting of wool grease, olive oil, and a small amount of petroleum, was held to be dutiable at $\frac{1}{2}$ c. per lb., as "wool grease," under paragraph 279 of the present tariff. The assessment of duty at 25 per cent. *ad valorem* as an "expressed or rendered oil" was overruled.—R. W. M.

BONE GREASE: U.S. CUSTOMS DECISION.

Aug. 19, 1904.

Crude bone grease was held to be dutiable at 20 per cent. *ad valorem*, under section 6 of the present tariff, as a "manufactured article unenumerated." The claim of the importer for free entry, under paragraph 568, as "grease for stuffing or dressing leather, and fit only for such uses," was overruled on the ground that the exclusive use of bone grease for such a purpose was not established by the evidence.—R. W. M.

SESAME AND PEANUT OIL: U.S. CUSTOMS DECISION.

Sept. 26, 1904.

A mixture of sesame and peanut oil, each of which is free of duty if imported separately, was held to be dutiable at 25 per cent. *ad valorem*, under paragraph 3 of the present tariff, as a "combination of expressed oils."

—R. W. M.

OLEINE: U.S. CUSTOMS DECISION.

Sept. 26, 1904.

It was decided that oleine, commercially known as red oil, and consisting of oleic acid, was dutiable at 25 per cent. *ad valorem* under paragraph 1 of the present tariff as an "acid not specially provided for." The claim of the importer for free entry under paragraph 568 was overruled on the ground that oleine is not exclusively used for soap making, but is also employed for oiling wool and as a constituent of certain polishing materials.—R. W. M.

XIII. B.—RESINS, VARNISHES, Etc.

SEALING WAX: U.S. CUSTOMS DECISION.

Sept. 9, 1904.

Sealing wax, which on analysis was shown to have the following composition:—Volatile at 100° C., 1·68 per cent.; resins, 72·65 per cent.; ash (calcium sulphate), 8 per cent.; colouring matter, &c. (sulphide of mercury), 18·07 per cent., was held to be dutiable at 20 per cent. *ad valorem* as a "manufactured article unenumerated" under section 6 of the present tariff. The assessment of duty at 25 per cent. *ad valorem* under paragraph 448, as a "manufacture of wax," was overruled.—R. W. M.

XIV.—TANNING, LEATHER, GLUE, Etc.

QUEBRACHO EXTRACT: U.S. CUSTOMS DECISION.

July 30, 1904.

"Quermos" extract was held to be dutiable at $\frac{1}{2}$ c. per lb. as "quebracho extract," under paragraph 22 of the present tariff, and not at $\frac{1}{2}$ c. per lb. as "bark extract," under the same paragraph.—R. W. M.

BONE SIZE SUBSTITUTE: U.S. CUSTOMS DECISION.

The United States Circuit Court decided that bone size substitute, consisting of starch, dextrin, magnesium chloride, and silica, was dutiable at 25 per cent. *ad valorem*, under paragraph 3 of the present tariff, overruling the assessment of duty at $1\frac{1}{2}$ c. per lb., as a "preparation fit for use as starch," under paragraph 285.—R. W. M.

XV.—MANURES, Etc.**POTASH IN AGRICULTURE.***U.S. Cons. Reps., No. 2083, Oct. 7, 1904.*

Official statistics show that the German mines produced, in 1903, 1,557,243 tons of kainite, worth at current prices 5,208,154 dols., and 2,073,771 tons of other potash salts, valued at 4,979,912 dols. Of the kainite and sylvinite 501,385 tons were exported, and of this amount 275,302 tons, or more than 54 per cent., was taken by the United States, where it was used mainly in the manufacture of chemical fertilisers. The remainder, something over a million tons of crude mineral, was used for fertilising purposes in Germany with excellent results. Exact official records, in which only the percentage of potash contained in the raw minerals used is taken into account, show that the consumption of potash salts in German agriculture increased from 51,282 tons in 1892 to 150,000 in 1903. During this period there has been a steady advance in the yield of the staple farm crops, which corresponds closely from year to year to the amount of potash used. Thus, when the consumption declined from 64,103 tons in 1894 to 58,974 tons in 1895, there was a corresponding falling off in yield of all the spring crops planted and harvested that year.

XVII.—BREWING, WINES, SPIRITS, Etc.**BREWING SUGAR; METHOD OF DENATURING —.***P. Petit. Ann. de la Brass., 1904, 7, 363—364.*

To enable sugar to be used in France free of duty, it is proposed to treat the sugar with half a litre of a 30 per cent. alcoholic hop extract per 100 kilos. by mixing the two for a few minutes in a hydro-extractor. The hop extract would be prepared under excise supervision, by treating hops with boiling 90 per cent. alcohol for at least 30 minutes, the quantity of solvent used being 3 litres per kilo. The product would be packed in sealed bottles.

The work of denaturing would be performed in specially authorised establishments, under excise supervision, the sugar being received in bond and supplied only to brewers. The latter would be empowered to use the sugar in the most convenient manner, without restriction.—C. S.

SPIRIT; DRAWBACKS OF EXCISE ON — IN HOLLAND.*Bd. of Trade J., Oct. 27, 1904.*

A Dutch Decree, dated the 29th August last, provides for the exemption from excise duty, subject to certain restrictions, of (1) spirit for use in vinegar factories and in public national, provincial, or communal institutions for instruction in natural sciences; and (2) spirit of a strength of at least 85 per cent., which by mixture with pyroligneous acid is rendered unfit for the preparation of beverages.

The Decree further provides that drawback of the excise duty paid on the spirit contained in sweet liqueurs, bitters, or other similar spirituous liquors, and in liquid perfumes, shall be allowed on the exportation of these articles to foreign countries, subject to compliance with the prescribed formalities.

XVIII. B.—SANITATION.**POLLUTION OF GERMAN WATERWAYS BY FACTORIES.***U.S. Cons. Reps., No. 2084, Oct. 18, 1904. From Deutsche Industrie Zeitung, July 29, 1904.*

The industrial council of Düsseldorf deals in its last report with methods of preventing pollution of waterways by refuse from factories emptying into them, and proposes the erection of basins in which such matter can be purified before entering into the waterways. This plan has been approved by the minister of commerce and industry, who now asks the president of the government to report the matter to the inspectors, to be acted on by them.

The question of protecting rivers from pollution by refuse from factories is becoming more and more important, especially for large rivers like the Rhine. Since factories are subject to approval, the respective concession methods

furnish a means to combat improper pollution of streams by prescribing suitable conditions before concession to build are granted. Numerous experiences in this region, however, have shown that the fulfilling of such conditions, and especially the official supervision, are accompanied by almost insurmountable difficulties if at the beginning the conditions have not been studied thoroughly. In the case of large chemical factories, with independent branches emptying different kinds of refuse into large, deep canals, this official supervision is almost impossible, the more so since during different parts of the day different kinds of refuse are discharged. The best method to overcome the difficulty is the erection of reservoirs in which the refuse may be diluted by the addition of pure water.

XX.—FINE CHEMICALS, Etc.**SACCHARIN: U.S. CUSTOMS DECISION.**

Merchandise invoiced as sodium benzoic sulfide and benzoic acid sulfide was assessed for duty as "saccharin," at 1 dol. 50 c. per lb., and 10 per cent. *ad valorem* under paragraph 211 of the present tariff. The importers claimed it to be dutiable at 25 per cent. *ad valorem* under paragraph 1 as an "acid not specially provided for," at the same rate under paragraph 3 as a "chemical compound," or at 20 per cent. *ad valorem* as a "preparation of coal tar not a colour or dye," under paragraph 15. The Board of General Appraisers, after an exhaustive investigation, affirmed the assessment of duty.—R. W. M.

BROMOFLUORESCIC ACID: U.S. CUSTOMS DECISION.*Aug. 3, 1904.*

Bromofluorescic acid was held to be dutiable at 20 per cent. *ad valorem* as a "preparation of coal tar not a colour or dye," under paragraph 15 of the present tariff. This decision is based on the ground that the provision for coal tar preparations is more specific than that for "chemical compounds" in paragraph 3, or for "acids not specially provided for" in paragraph 1.—R. W. M.

METHYLPYROCATECHIN CARBONIC ESTER: U.S. CUSTOMS DECISION.*July 30, 1904.*

Merchandise invoiced as above, and in a crude state, unfit for administering as a medicine, was held to be dutiable as a "preparation of coal tar not a colour or dye" at 20 per cent. *ad valorem*, under paragraph 15 of the present tariff. The assessment of duty at 25 per cent. *ad valorem* as a "chemical compound" under paragraph 3 was overruled.—R. W. M.

Patent List.

N.B.—In these lists, [A.] means "Application for Patent," and [C.S.] "Complete Specification Accepted."

Where a Complete Specification accompanies an Application, an asterisk is affixed. The dates given are (i) in the case of Applications for Patents, the dates of application, and (ii) in the case of Complete Specifications Accepted, those of the Official Journals in which acceptances of the Complete Specifications are advertised.

Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, AND MACHINERY.

- [A.] 22,633. Woolford. *See under X.*
- " 22,679. Ebers. Method of producing granular substances from molten materials. Oct. 20.
- " 22,794. Perks. Crucible furnaces and the like. Oct. 22.
- " 22,868. Michelbach. Condensers. Oct. 24.
- " 22,878. Salenius. Separating liquids.* Oct. 24.
- " 22,951. Gutensohn. Treatment of by-products. Oct. 25.

- [A.] 23,066. Lake (Caspar). Apparatus for drying granular and like materials.* Oct. 26.
 „ 23,070. Bamber. Centrifugal separators. Oct. 26.
 „ 23,081. Kent. Furnaces.* Oct. 26.
 „ 23,183. Wells. Drying apparatus.* Oct. 27.
 „ 23,204. British Thomson-Houston Co., Ltd. (Gen. Electric Co.). See under XI.
 „ 23,261. Wilson. Filters. Oct. 28.
 „ 23,336. Burgess. Condensers. Oct. 29.
 [C.S.] 22,559 (1903). Prinsep. Furnaces fired with powdered coal. Oct. 26.
 „ 22,845 (1903). Boutcher and Boutcher. Means for discharging acids and other liquids from carboys and other receptacles by pneumatic pressure. Nov. 2.
 „ 23,091 (1903). Austin. Centrifugal separators. Oct. 26.
 „ 23,900 (1903). Paul. Apparatus for regulating temperature. Nov. 2.
 „ 24,379 (1903). Schneller and Koeleman. Apparatus for bringing gas and liquid into intimate contact. Nov. 2.
 „ 11,854 (1904). Kathol. Filters. Nov. 2.
 „ 12,358 (1904). Soc. l'Air Liquide. See under VII.
 „ 14,621 (1904). Bonnet. Apparatus for mixing, emulsifying, and homogenising liquids. Oct. 26.
 „ 16,604 (1904). Smith. Funnels for liquids. Oct. 26.
 „ 17,586 (1904). Steele. Furnaces. Oct. 26.

II.—FUEL, GAS, AND LIGHT.

- [A.] 22,342. Körting und Mathiesen Act.-Ges. Arc lamp electrodes. [German Appl., Oct. 31, 1903.]* Oct. 17.
 „ 22,470. Carolan (Whitney). Filaments of the kind used in incandescent electric lamps, and processes of manufacturing said filaments. Oct. 18.
 „ 22,593. Brotherhood. Producer gas manufacturing apparatus. Oct. 20.
 „ 22,815. Boulton (Cie. pour le Fabr. des Compteurs et Matériel d'Usines à Gaz). Gas purifiers.* Oct. 22.
 „ 22,843. Whitfield. Gas producers. Oct. 24.
 „ 22,917. Oliphant and Scott. Apparatus for converting oil into gas. Oct. 25.
 „ 23,184. Russell and Russell. Means for producing and utilising inflammable gas.* Oct. 27.
 „ 23,352. Hellstern. Carbons for electric arc lamps. Oct. 29.
 „ 23,386. De Lachomette. Coking ovens. Oct. 29.
 [C.S.] 22,090 (1903). Cornaro. See under XI.
 „ 23,616 (1903). Heenan. Apparatus for the manufacture of crude gas from coal and other material. Nov. 2.
 „ 15,860 (1904). Derval. Retort benches for the manufacture of illuminating gas. Nov. 2.
 „ 16,460 (1904). Clarke. Incandescent gas burners and mantles. Nov. 2.
 „ 17,661 (1904). Redfern (Poetter and Co.). Coking ovens. Oct. 26.
 „ 20,277 (1904). Abel (Siemens und Halske A.-G.). Manufacture of incandescence bodies for electric glow lamps. Oct. 26.
 „ 20,371 (1904). Rincker and Wolter. Production of oil gas. Nov. 2.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM, AND MINERAL WAXES.

- [A.] 23,379. Zimpell. Sulphate of ammonia saturators. [German Appl., March 30, 1904.]* Oct. 29.

- [C.S.] 22,091 (1903). Thompson (Ges. zur Verwerthung der Boleg'schen Wasserlöslichen Mineralöle u. Kohlenwasserstoffe). Production of water-soluble or easily and permanently emulsifiable hydrocarbon derivatives. Oct. 26.
 „ 22,092 (1903). Thompson (Ges. zur Verwerthung der Boleg'schen Wasserlöslichen Mineralöle u. Kohlenwasserstoffe). Production of water-soluble or emulsifiable vaseline. Oct. 26.

IV.—COLOURING MATTERS AND DYESTUFFS.

- [A.] 22,785. Johnson (Badische Anilin und Soda Fabrik). Manufacture of azo colouring matter. Oct. 21.
 „ 23,072. Newton (Bayer and Co.). Manufacture of new tetrazo dyestuffs. Oct. 26.
 „ 23,193. Imray (Meister, Lucius und Brünig). Manufacture of blue and violet to black dyestuffs by oxidation on the fibre. Oct. 27.
 „ 23,198. Johnson (Badische Anilin und Soda Fabrik). Manufacture of rhodamine colouring matters and intermediate products. Oct. 27.
 [C.S.] 24,930 (1903). Johnson (Badische Anilin und Soda Fabrik). Manufacture of sulphur colouring matters and intermediate products. Nov. 2.
 „ 26,182 (1903). Imray (Meister, Lucius und Brünig). Manufacture of dyestuffs derived from anthracene. Nov. 2.
 „ 712 (1904). Johnson (Badische Anilin und Soda Fabrik). Manufacture of colouring matters of the anthracene series. Oct. 26.
 „ 1889 (1904). Newton (Bayer and Co.). See under XIII. A.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

- [A.] 22,295. Walker. Bleaching cloth. Oct. 17.
 „ 23,193. Imray (Meister, Lucius und Brünig). See under IV.
 „ 23,305. Mellor. Method of and means for cleaning or clearing silk and like yarns or threads. Oct. 29.
 [C.S.] 24,637 (1903). Howorth (Soc. Franç. de la Viscose). Dressing of yarns and like material. Oct. 26.
 „ 26,591 (1903). Watson and Hoyle. Manufacture of woven fabrics and production thereon of figured or variegated effects. Oct. 26.
 „ 1867 (1904). Johnson (Badische Anilin und Soda Fabrik). Discharge of halogenated indigo colouring matters. Nov. 2.
 „ 15,395 (1904). Venter. Process for bleaching textile materials. Nov. 2.

VI.—COLOURING WOOD, PAPER, LEATHER, ETC.

- [A.] 22,547. Lake (Chem.-Techn.-Fabrik, Dr. A. B. W. Brand und Co.). See under IX.
 „ 23,292. Lake (Chem.-Techn.-Fabrik, Dr. A. B. W. Brand und Co.). See under IX.

VII.—ACIDS, ALKALIS, AND SALTS.

- [A.] 22,323. Johnson (Badische Anilin und Soda Fabrik). Manufacture of stable hydrosulphates. Oct. 17.
 „ 22,348. Szek. Means for the formation and utilisation of ozone. Oct. 17.
 „ 22,540. Johnson (Badische Anilin und Soda Fabrik). Production of technically pure cyanogen compounds. Oct. 19.
 „ 22,940. Reaney. Manufacture of hydrated lime from quicklime.* Oct. 25.

- [A.] 23,036. Spence, and Peter Spence and Sons, Ltd. Manufacture of aluminous compounds. Oct. 26.
- " 23,879. Zimpell. *See under* III.
- [C.S.] 23,550 (1903). Hemingway. Kiln* applicable for use in the manufacture of oxide of iron. Nov. 2.
- " 2655 (1904). Keogh and Broughton. Methods of making aluminium compounds and bye products. Oct. 26.
- " 12,358 (1904). Soc. l'Air Liquide (Soc. Anon. pour l'Étude et l'Exploitation des Procédés G. Claude) and Lévy. Method of separating air and gaseous mixtures into their elements, and apparatus therefor. Nov. 2.
- " 19,924 (1904). Cie. des Prod. Chimiques d'Alais et de la Carmarque. Manufacture of alumina. Oct. 26.
- " 20,797 (1904). Fink-Huguenot. Preparation of metallic oxides by the direct combustion of metals, and apparatus therefor. Nov. 2.

VIII.—GLASS, POTTERY, AND ENAMELS.

- [A.] 22,655. Imray (Pressed Prism Plate Glass Co.). Manufacture of glass sheets or slabs.* Oct. 20.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

- [A.] 22,366. Herdman. Apparatus for the production of slag wool. Oct. 17.
- " 22,423. Fairweather (Nettleton). *See under* XIII. A.
- " 22,547. Lake (Chem.-Techn.-Fabrik Dr. Alb. R. W. Brand und Co.). Process for colouring natural stone.* Oct. 19.
- " 22,678. Ebers. Method of producing a building material having the properties of trass and similar products. Oct. 20.
- " 22,940. Reaney. *See under* VII.
- " 22,990. Lake (Rütgerswerke Act.-Ges.). Preservation of wood.* Oct. 25.
- " 23,292. Lake (Chem.-Techn.-Fabrik Dr. Alb. R. W. Brand und Co.). The colouring of stone. Oct. 28.
- " 23,364. Van der Vijgh. Manufacture of artificial stone. Oct. 29.
- [C.S.] 22,213 (1903). Bond. Apparatus and process for utilising gas lime or other calcium compounds and clinker, slag, or other siliceous or aluminous material for the manufacture of cement or moulded articles. Oct. 20.
- " 25,374 (1903). Michell and Michell. Manufacture of material suitable for use as a non-conducting covering for steam-pipes, boilers, &c. Oct. 26.
- " 20,018 (1904). Ridley, Tate, and Williamson. Slag or scoria bricks or blocks. Oct. 26.

X.—METALLURGY.

- [A.] 22,346. Huntington. Alloying metals. Oct. 17.
- " 22,422. Auchisachie. Process of obtaining metallic vanadium from its ores or other vanadium compounds. Oct. 18.
- " 22,438. Carson and Ogle. Treatment of zinc and other ores. Oct. 18.
- " 22,683. Woolford. Oxidising and sublimation furnaces. Oct. 20.
- " 22,659. Morgan Crucible Co., Ltd., and Spiers. *See under* XI.
- " 22,688. Zohrab. Manufacture of steel, and the smelting or reduction of iron or other ores and metals. Oct. 21.
- " 22,814. Richardson. Processes for smelting and refining metals, and apparatus therefor. Oct. 22.

- [A.] 23,111. Wynne. Machines for the concentration of ores or other substances of different specific gravities. Oct. 27.
- " 23,153. Crowley and Blackman. Furnace or crucible for the reduction or refining of metals. Oct. 27.
- " 23,255. Lett, and Metalia, Ltd. Extraction of copper from its ores. Oct. 28.
- " 23,256. Lett, and Metalia, Ltd. Vats used in the extraction of metals from their ores. Oct. 28.
- " 23,331. De Dion and Bouton. Manufacture of case-hardened articles of chrome-nickel steel. [Fr. Appl., April 23, 1904.]* Oct. 29.
- " 23,380. Soc. Electrométall. Française. *See under* XI.
- [C.S.] 20,419 (1903). Sulman and Kirkpatrick - Picard. Separation of minerals from ores and gangue. Nov. 2.
- " 23,299 (1903). Fitzmaurice. Treating molten or semi-molten metal. Nov. 2.
- " 23,457 (1903). Alexander and Shiels. Annealing of metals, and apparatus therefor. Nov. 2.
- " 25,950 (1903). Cockburn. Manufacture of steel. Oct. 26.
- " 18,746 (1904). Goodsell. Method of and apparatus for treating sheet iron and steel. Oct. 26.
- " 19,140 (1904). Swyny and Plucknett. Ore separators and classifiers. Nov. 2.
- " 20,797 (1904). Fink-Huguenot. *See under* VII.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

- [A.] 22,659. Morgan Crucible Co., Ltd., and Spiers. Composition or compound for brushes of dynamo electric machines, for bearings, and other articles. Oct. 20.
- " 22,743. British Thomson-Houston Co., Ltd. (General Electric Co.). Apparatus for the electrical treatment of gases. Oct. 21.
- " 23,204. British Thomson-Houston Co., Ltd. (General Electric Co.). Electric heating apparatus. Oct. 27.
- " 23,380. La Soc. Electro-Métallurgique Française. Process for smelting nickel ores in an electric furnace, and an improved crucible therefor. [Fr. Appl., Oct. 30, 1903.]* Oct. 29.
- [C.S.] 22,090 (1903). Cornaro. Manufacture of electrodes and resistances. Oct. 26.
- " 15,952 (1904). Berg. Electrode for electrical accumulators. Nov. 2.

XII.—FATTY OILS, FATS, WAXES, AND SOAP.

- [A.] 23,187. Markel. Process of and apparatus for producing bars of soap. Oct. 27.
- " 23,368. Berry. Semi-solid lubricants, and process for manufacturing same. Oct. 29.
- [C.S.] 25,868 (1903). Iveson and Wilson. Cooling melted fats or fatty substances, or the like. Nov. 2.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, ETC.

(A.)—PIGMENTS, PAINTS.

- [A.] 22,423. Fairweather (Nettleton). Composition of matter for fireproof paint or coating.* Oct. 18.
- " 22,732. Kollinger. Manufacture of paint. [Ger. Appl., Oct. 21, 1903.]* Oct. 21.
- [C.S.] 23,550 (1903). Hemingway. *See under* VII.
- " 1389 (1904). Newton (Bayer and Co.). Manufacture of new colour lakes. Nov. 2.

(B.)—RESINS, VARNISHES.

- [A.] 23,173. Staeding. Manufacture of linoleum.* Oct. 27.
 [C.S.] 16,800 (1904). Bucklin. Lac derivatives. Nov. 2.

(C.)—INDIA-RUBBER.

- [A.] 23,168. Frost. Vulcanising apparatus. Oct. 27.
 [C.S.] 17,579 (1904). Tiehse. Manufacture of an improved substitute for india-rubber. Nov. 2.

XIV.—TANNING; LEATHER, GLUE, SIZE, Etc.

- [A.] 22,395. De Marneffe. Process of and apparatus for tanning leather. Oct. 18.
 „ 23,952. Wetter (Thüringer Gelatinefabrik E. Jetter und Krause). Gelatine or gelatinous foodstuffs. Oct. 25.
 „ 23,016. Dougherty. Machines for mechanically seasoning, oiling, or otherwise treating skins.* Oct. 25.

XV.—MANURES, Etc.

- [A.] 23,045. Bollé (Conrad Schmidt and Co.). Process of and apparatus for manufacturing artificial manure from offal and the like. Oct. 26.
 [C.S.] 3170 (1904). Laer. Fertiliser, and process of making same. Oct. 26.

XVI.—SUGAR, STARCH, GUM, Etc.

- [C.S.] 27,186 (1903). Gray, Osborn, Stocks, and White. Manufacture of gum tragacanth from locust kernels. Nov. 2.

XVII.—BREWING, WINES, SPIRITS, Etc.

- [A.] 22,704. Hornof. Malt kilns.* Oct. 21.
 „ 23,277. Schrotky. Manufacture of material for use in the production of fermented liquors. Oct. 28.

XVIII.—FOODS; SANITATION, WATER PURIFICATION; & DISINFECTANTS.**(A.)—FOODS.**

- [A.] 22,358. Provoyeur. Manufacture of chocolate.* Oct. 17.
 „ 22,476. Glas. Production of desiccated milk and milk preparations. [German Appl., Nov. 12, 1903.]* Oct. 18.
 „ 22,512. Williamson. Meat extracts or preparations. Oct. 19.
 „ 22,513. Williamson. Cocoa, chocolate, and preparations of same. Oct. 19.
 „ 22,639. Hatmaker. Cacao, sugar, and milk compounds in dry, flaky form. Oct. 20.
 „ 22,927. Preisz. Method of sterilising foodstuffs and the like. [German Appl., Oct. 28, 1903.]* Oct. 25.
 „ 22,952. Wetter (Thüringer Gelatinefabrik E. Jetter und Krause). See under XIV.
 „ 23,100. Döllner. Production of desiccated milk and milk preparations. [Ger. Appl., Nov. 12, 1903.]* Oct. 26.
 „ 23,177. Müller. Food preparation.* Oct. 27.

- [C.S.] 5946 (1904). Butler. Manufacture of milk in powder form, applicable also to the treatment of other solutions containing fatty matter. Nov. 2.
 „ 20,291 (1904). Kennedy. Treatment of milk. Oct. 26.

(B.)—SANITATION; WATER PURIFICATION.

- [A.] 22,724. McLean and Paterson. Treatment of sewage. Oct. 21.
 „ 23,045. Bollé (Schmidt and Co.). See under XV.
 [C.S.] 24,651 (1903). Byrne, Scott, and Wheatley. Compound for preventing incrustation in steam boilers. Nov. 2.
 „ 28,379 (1903). Taylor. Means or apparatus for distributing sewage or sewage effluent upon filter beds. Nov. 2.

XIX.—PAPER, PASTEBOARD, Etc.

- [A.] 22,381. Parkin and Williams. Process for rendering celluloid or nitric cellulose compounds non-inflammable. Oct. 18.
 „ 22,385. Castiglione. Treatment of pulp. Oct. 18.
 [C.S.] 28,212 (1903). Parkin, Williams, and Cassou. Process for rendering celluloid non-inflammable. Nov. 2.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

- [A.] 22,806. Imray (Meister, Lucius und Brüning). Manufacture of dialkylmalonic acid derivatives and dialkylmalonyl ureas. Oct. 22.
 [C.S.] 25,481 (1903). Ashworth. Production of saccharin. Oct. 26.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

- [A.] 23,988. Soc. Anon. Plaques et Papiers Photographiques A. Lumière et ses fils. Process of colour photography. [Fr. Appl., Dec. 17, 1903.]* Oct. 25.
 „ 23,064. Lucas. Photographic negative. Oct. 26.
 „ 23,098. Gärtner. Process of and means for the production of relief photographs or the like. Oct. 26.
 [C.S.] 19,940 (1904). Smith. Photographic plates and films. Oct. 26.

XXII.—EXPLOSIVES, MATCHES, Etc.

- [A.] 22,390. Bennett and Castiglione. Explosives for machine guns and other purposes. Oct. 18.
 „ 23,051. Tyler. Matches. Oct. 26.
 „ 23,269. Dickson. Manufacture of blasting cartridges. Oct. 28.
 „ 23,366. King's Norton Metal Co., Ltd., Bayliss and Brownson. Additions to the materials employed in the manufacture of percussion caps, detonators, igniters, &c., for the ignition or detonation of explosives. Oct. 29.
 [C.S.] 26,978 (1903). Talbot. Explosive compounds and the manufacture thereof. Oct. 26.
 „ 4699 (1904). Haddan (Führer). Manufacture of explosives of the nitrate of ammonia group. Oct. 26.
 „ 7490 (1904). Rusher and Baudinet. Explosives. Nov. 2.

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 E. Divers, M.D., D.Sc., F.R.S. "Theory of the Action of Metals on Nitric Acid."
 Mr. Llewellyn J. Davies. "A Rapid and Accurate Method for the Estimation of Phosphorus in Iron Ores."
 Mr. C. S. Stanford Webster, F.I.C. "Fluorescope for comparing Substances under the Influence of Radium Rays."
 Monday, Jan. 9, 1905.—Mr. Walter F. Reid, F.I.C. "Some Chemical Aspects of the St. Louis Exhibition."

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ST. LOUIS EXHIBITION, 1904. ADDITIONAL LIST OF AWARDS TO BRITISH EXHIBITORS.

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DEPARTMENT OF LIBERAL ARTS.

Group 23.—Chemical and Pharmaceutical Arts.—Gold Medal: Wellcome Chemical Research Laboratories: Read Holliday and Sons; Jeyes' Sanitary Compounds Company (Limited). **Silver Medal:** Dr. G. Barger (collaborator to the Wellcome Physiological Research Laboratories); Dr. Frederick B. Power (collaborator to the Wellcome Chemical Research Laboratories).

DEPARTMENT OF AGRICULTURE.

Group 80.—Fertilisers.—Grand Prize: The United Alkali Company (Limited).

Group 87.—Farinaceous Products and their Derivatives.—Gold Medal: Allen and Hanburys (Limited).

Group 93.—Fermented Beverages.—Silver Medal: E. Dyer and Co.

DEPARTMENT OF MINES AND METALLURGY.

Group 116.—Ores and Minerals.—Gold Medal: The British South Africa Company (Rhodesia). **Silver Medal:** J. C. Burrow (collaborator to the Home Office).

Group 118.—Metallurgy.—Grand Prize: The Monk Bridge Iron and Steel Company (Limited); The Farnley Iron Company (Limited).

The total number of awards secured by Great Britain now stands thus:—Grand prizes, 142; gold medals, 250; silver medals, 170; bronze medals, 134. Total, 696.

THE JOURNAL.

From the beginning of next year the Society's Journal will be printed and published by Messrs. Vacher and Sons, Great Smith Street, Westminster, S.W., to whom all communications regarding subscribers' copies and advertisements should be sent.

SUBSCRIPTIONS FOR 1905.

Foreign and Colonial Members are reminded that the subscription of 25s. for 1905, payable on January 1st next, should be sent in good time to the Hon. Treasurer (Mr. Samuel Hall), in order to ensure continuity in the receipt of the Society's Journal. Any changes of address to appear in the new List of Members now in course of preparation should reach the General Secretary not later than January 15th, 1905.

List of Members Elected

23rd NOVEMBER 1904.

- Aston, Francis William, Tennyal House, Harborne, near Birmingham, Chemist.
Bryant, Arthur P., 661, Winthrop Avenue, Chicago, Ill., U.S.A., Chemist.
Calvert, Harry Thornton, West Riding of Yorkshire Rivers Board, Wakefield, Chemist.
Clark, Dr. Homer, c/o The Vacuum Varnish and Chemical Co., 6, Seaview Avenue, East Norwalk, Conn., U.S.A., Chemical Manufacturer.
Cowee, Harvey D., 161, River Street, Troy, N.Y., U.S.A., Chemist.
Dempwolf, Chas., jun., 713, S. George Street, York, Pa., U.S.A., Chemical Manufacturer.
Falk, Milton J., 16, East 81st Street, New York City, U.S.A., Teacher of Chemistry.
Fletcher, William E., Forcite Powder Co., Landing, N.J., U.S.A., Chemist.
Foust, Thomas B., c/o Bon Air C. & I. Co., Allen's Creek, Tenn., U.S.A., Chemist.

- Frasch, George B., 543, Morris Avenue, Elizabeth, N.J., U.S.A., Chemist.
Goodier, Herbert, 16, Hall Road, Shipley, Bradford, Yorks., Textile Engineer.
Heurich, Christian, 1307, New Hampshire Avenue, N.W., Washington, D.C., U.S.A., Brewer.
Lane, C. Cyril P., c/o The Avon India-Rubber Co., Melksham, Wilts., Chemist.
Law, Herbert, 72, Belvedere Road, Liscard, Cheshire, Analytical Chemist.
Lesley, R. W., Pennsylvania Building, Philadelphia, Pa., U.S.A., Cement Manufacturer.
Mabee, Fred Carleton, McMaster University, Toronto, Ontario, Canada, Assistant in Chemistry.
Marchworth, O. S., Ohio Testing Laboratory, 19 and 25, Board of Trade, Columbus, Ohio, U.S.A., Analytical Chemist.
Miller, William Exley, c/o The Arizona Copper Co., Ltd., 29, St. Andrew Square, Edinburgh, Secretary.
Mukerjee, Dr. S. C., Imperial Pharmacy, Umballa Cantonment, Punjab, India, Pharmacist.
Pickett, Chas. E., 26, East 23rd Street, Bayonne, N.J., U.S.A., Superintendent, Borax Refinery.
Rapelje, Walter S., 957, Liberty Avenue, Brooklyn, N.Y., U.S.A., Chemist.
Remington, Prof. Joseph P., 1832, Pine Street, Philadelphia, Pa., U.S.A., Author, U.S. Pharmacopoeia.
Richardson, Wm. S., 201, High Street, Lincoln, Chemical Manure Manufacturer.
Robinson, Prof. Franklin C., Bowdoin College, Brunswick, Maine, U.S.A., Professor of Chemistry.
Rosenblatt, A.H., c/o Tech Brothers, 52—62, 9th Street, Long Island City, N.Y., U.S.A., Superintendent and Chemist.
Schmiewind, Heinrich, jun., Susquehanna Silk Mills, 62, Greene Street, New York City, U.S.A., Vice-President and Treasurer.
Schultz, Carl E., 440, First Avenue, New York City, U.S.A., Mineral Water Manufacturer.
Setzler, Dr. Horace B., c/o Lake Carriers Oil Co., Coraopolis, Pa., U.S.A., Superintendent.
Skowinski, S., Republic Rubber Co., Youngstown, Ohio, U.S.A., Chemist.
Smallman, J. E., c/o Canada Chemical Manufacturing Co., Ltd., London, Ont., Canada.
Speiden, C. C., Summit, N.J., U.S.A., Chemical Merchant.
Toyne, Francis D., c/o Messrs. Henry Ashwell and Co., New Basford, near Nottingham, Chemist.
Trubek, M., Wood Ridge, Bergen County, N.J., U.S.A., Manufacturing Chemist.
Tunnell, Raymond W., 425, West Walnut Lane, Germantown, Philadelphia, Pa., U.S.A., Manufacturer.
Turnbull, R. H., c/o MacAndrews and Forbes Co., Smyrna, Turkey, Asia Minor, Analytical Chemist.
Young, James, c/o Flax Pulp, Ltd., Weston Point, Runcorn, Cheshire, Chemist.

Changes of Address.

When notifying new addresses, members are requested to write them distinctly, and state whether they are temporary or permanent. Multiplication of addresses is also to be avoided as tending to create confusion. When sending subscriptions, the use of the form attached to the application helps in the verification of addresses, on which the safe delivery of the Journal depends.

- Archbold, Dr. Geo., 1/o Ontario; c/o Ono Manufacturing Co., Research Laboratory, Middletown, Conn., U.S.A.
Bousfield, E. G. P., 1/o York; Ozonised Oxygen Co., Ltd., 20, Mount Street, Manchester.
Boyd, Wm., 1/o Johannesburg; P.O. Box 143, Germiston, Transvaal.
Brown, Wm., 1/o Great Clowes Street; Terrace House, The Cliff, Higher Broughton, Manchester.
Chemical Trade Journal, 1/o Manchester; Lane's Inn House, 265, Strand, London, W.C.

Craven, Jas., l/o Manchester; c/o Columbia Creosoting Co., Shirley, Ind., U.S.A.
 Dodd, A. J., l/o Riverview; Heathfield House, Belvedere, Kent, Works Manager.
 Holmes, F. G., l/o Liverpool; Northcroft, Tewit Well Road, Harrogate, Yorks.
 Jones, Wm. App., l/o New York; c/o Boston Artificial Leather Co., Stamford, Conn., U.S.A.
 Jonker-Czn., H., l/o Wörth; Hotel Europäischer Hof, Hagenau, Elsass, Germany.
 Kibble, W. Oakes, l/o Denver; Journals to General Delivery, St. Louis, Mo., U.S.A.
 Koebig, Dr. J., l/o East Third Street; 127, West First Street, Los Angeles, Cal., U.S.A.
 Le Maistre, Fred. J., l/o Montreal; Henry S. Spackman Engineering Co., 1619, Filbert Street, Philadelphia, Pa., U.S.A.
 Lindsay, Robt., l/o Alexandria; Geldenbuis Deep G.M. Co., Cleveland, Johannesburg, Transvaal.
 Millar, J. H., l/o Greytown; Box 440, Durban, Natal.
 More, A., l/o Government Laboratory; 19, Ryecroft Street, Fulham, S.W.
 Moses, Herbert B.; Journals to c/o Berkely Hotel, Buffalo, N.Y., U.S.A.
 Quinan, Wm. R.; Journals to the General Manager, De Beers Explosive Works, Dynamite Factory, Cape Colony, South Africa.
 Ratcliffe, Chas. F., l/o Leeds; c/o Brotherton and Co., Ltd., Provan Chemical Works, Millerston, Glasgow.
 Ripley, Philip F., l/o Providence; 48, Central Street, Andover, Mass., U.S.A.
 Sohlichtung, E., l/o Hicks Street; 38, Cranberry Street, Brooklyn, N.Y., U.S.A.
 Seligman, Dr. R.; Journals to 17, Kensington Palace Gardens, London, W.
 Shields, Dr. John, l/o Willesden Green; Minas de Rio Tinto, Prov. de Huelva, Spain.
 Taylor, Jno., l/o Great Crosby; c/o Brotherton and Co., Ltd., Tar Works, Litherland, Liverpool.
 Thatcher, E. J., l/o Knowle; The Manor House, Chew Magna, near Bristol.
 Tyler, Charles R., l/o West 57th Street; c/o Dr. Francis Wyatt, 402, West 23rd Street, New York City, U.S.A.
 Warden, Jno. B., l/o Deadwood; Sevier Mine, Kimberley, Utah, U.S.A.
 Wense, Dr. W., l/o Griesheim; c/o Herrn H. Schultz, Graalstrasse, Lüneburg, Germany.
 Wilkins, A. D., l/o Elizabeth; Bellevue P.O. Station, Allegheny, Pa., U.S.A.
 Wilson, A. Poole, l/o Nova Terrace; 81, Botanic Road, Glasnevin, Dublin.

CHANGE OF ADDRESS REQUIRED.

Jones, G. Poole, l/o Park Hotel, Williamsport, Pa., U.S.A.

MEMBERS OMITTED FROM LIST.

1902. Forster, Ferdinand E. P., c/o Messrs. Bass and Co., 19, Guild Street, Burton-on-Trent, Chemist.
 1900. Richardson, Wm. Derrick, 4306, Forestville Avenue, Chicago, Ill., U.S.A., Chemist (Swift and Co.).
 1893. Welch, J. Cuthbert, Montreal and Boston Cons. Mining and Smelting Co., Boundary Falls, B.C., Canada, Chemist and Metallurgist.

CORRECTION.

Sir Michael B. Nairn, Bart., is the father of Mr. Michael Nairn, member of this Society.

Death.

Newton, John, Park Green, Macclesfield.

Annual General Meeting,

NEW YORK, 1904.

PITTSBURG, THURSDAY, SEPT. 15TH.

RECEPTION COMMITTEE.

K. F. Stahl, Chairman.
 Jas. O. Handy, Secretary.
 H. K. Porter, Treasurer.

Chester B. Albree.	A. G. McKenna.
Edward E. Armstrong.	Walter H. Stiefel.
Jas. M. Camp.	F. Schniewind.
H. W. Craven.	Emil Swenson.
John E. Hurford.	C. P. Tiers.
Geo. A. Macbeth.	

Ladies' Committee.

Miss Mary Lynne, Chairman.

Mrs. Chester B. Albree.	Mrs. H. K. Porter.
Miss Mary Lynne.	Mrs. K. F. Stahl.
Mrs. J. F. Hurford.	Mrs. Emil Swenson.
Mrs. W. H. McKenna.	Mrs. C. P. Tiers.

On arrival at the Pittsburg station the visitors were received by Dr. K. F. Stahl, Mr. Jas. O. Handy, and other members of the Reception and Ladies' Committee, and conveyed to the Hotel Schenley. After dinner the Pittsburg Exposition was visited.

FRIDAY, SEPT. 16TH.

The ladies visited the Phipps Conservatory, in Schenley Park, and then went for a drive, lunching *en route* at the County Club. In the afternoon they visited the Ward-Mackey Bakery, and in the evening went to the theatre.

The gentlemen in the morning visited the Westinghouse Electric and Manufacturing Co. and the Westinghouse Machine Co., and were conducted through the works by the managers, assisted by a large staff of guides.

The Westinghouse Electric and Manufacturing Co. was organised in 1886; the works were then situated in Pittsburg, and employed 200 men. In 1895, increasing business necessitated removal of the premises to the present site in East Pittsburg, and in 1899 further extension was commenced, and has been continued, until now the works contain a total floor space of about 47 acres, and employ 9000 men, exclusive of the 3000 employed in the various branch works in the United States. The scope of the works may be gauged by the fact that, in the engineering department alone, a staff of 350 mechanical and electrical experts is employed. The offices and works are connected by a local telephone system, which has 400 instruments, and a pneumatic tube system. The erecting shops consist of three aisles, two of which are 1184 ft. long and 70 ft. wide, whilst the third is 1760 ft. long by 70 ft. Among the work turned out by the company may be mentioned the 5500-k.w. turbo-generator unit and eight 5000-k.w. alternating current generators supplied for the Manhattan Elevated Railway (New York), and the nine 5000-k.w. alternating current generators supplied for the subway division of the New York Interborough Rapid Transit System. The company is now building transformers of 2750 k.w. capacity, and motors up to 2000 h.p.

The party were then conveyed on special cars to Kennywood Park, on the further side of the Monongahela River, where lunch was served.

After lunch a portion of the party visited the Duquesne Blast Furnaces, Steel Works, and Rolling Mill, while the remainder went to the Homestead Steel Works and Rolling Mill, both belonging to the Carnegie Steel Co.

The Duquesne plant includes four blast furnaces, two 10 gross ton Bessemer converters, and fourteen 50 gross ton basic open-hearth furnaces. The product consists of billets, blooms, slabs, sheet, bars, splice bars, and merchant bars. The annual capacity of this plant is 600,000 tons of Bessemer steel ingots and 480,000 tons of open-hearth steel ingots.

The Homestead plant includes five blast furnaces, fifty 50 gross ton basic open-hearth furnaces, and two 10 gross ton Bessemer steel converters. It produces blooms, billets, slabs, structural shapes, structural work, boiler plates, ship plates, tank plates, universal plates, armour plates, and open-hearth steel castings. The annual capacity of the plant is 425,000 tons of Bessemer steel ingots and 1,550,000 tons of basic open-hearth steel ingots. The blast furnaces are on the other side of the Monongahela River, and the molten metal is conveyed across a bridge to the steel furnaces. This takes three-quarters of an hour, which, seeing that the metal would require some four and a half hours to solidify, leaves an ample margin of time. What strikes the visitor is the economy of labour in handling the great blooms resulting from these operations. Electrically driven machinery rolled ingots of steel weighing more than 10 tons into 40 ft. of steel plate, 5 ins. thick, with the utmost ease. A pyramidal framework, 30 or 40 ft. high, moved about at the bidding of one man seated at the apex, seized an ingot with tongs, put it through the rollers, received it in a new spot, put it through again and again, and then took it to a fresh place and repeated the operation. All this was done by electrically transmitted power. Every now and then water was thrown on the surface of the ingots, then a phosphate, and, though the water created no explosion, the addition of the salt did. Economy of handling and perfection of organisation and arrangement were the lessons taught by this day's visits. Every care and consideration seemed also to be given to the comfort and happiness of the workpeople.

The Union Switch and Signal Co., the Westinghouse Air Brake Co., and the McKeesport Tin Plate Co. were also open to members.

In the evening a smoking concert was held in the banquet hall of the Hotel Schenley.

SATURDAY, SEPT. 17TH.

In the morning one party visited the Phoenix Glass Co.'s works at Monaca, the works of the Pressed Steel Car Co., and the Lake Erie Railroad shops. A second visited the Allegheny Plate Glass Co.'s works. A third visited the Ward-Mackey Co.'s bakery and the food products factory of the H. J. Heinz Co. The ladies joined in this visit, and were each presented with souvenirs by the H. J. Heinz Co. All were impressed with the extreme cleanliness of the factory. A fourth party visited a coal mine, and a fifth went to the Atlantic Refining Co.'s oil works, and thence to the Nernst Lamp Co.'s factory. Another coal mine, the Harbison-Walker Refractories Co.'s works, and those of the Armstrong Cork Co. were also thrown open. Messrs. Heeren Bros. and Co., manufacturing jewellers, also specially invited inspection by the ladies. Accounts of these visits will be published as received.

The Nernst Lamp Co.—The Nernst lamp is the only electric incandescent lamp the filament of which glows in the open air. Certain rare earths, notably zirconia and thoria, belong to the class of "secondary conductors," viz., they permit the passage of an electric current only under certain conditions, of which heating is one. It is therefore necessary to induce this condition before the current can pass. This is done by means of heaters consisting of hollow cylinders made of pure kaolin, looking like a piece of the stem of a clay pipe, wound round with platinum wire, protected in its turn with a coating of some silicate, which also acts as a radiator. This heater may again be wound into a spiral, through which the glower or filament is inserted; or a heater may be placed on either side of the glower. When the current is turned on, it first passes through the heater, which in its turn heats the glower until the temperature rises sufficiently to permit a current to pass through that, whereupon, by an ingenious automatic arrangement, the current is cut off the heater and passes solely through the glower. The number of glowers to a lamp varies from one to six. They are usually made in the form of a slender rod, with a little ball at each end, and consist of a mixture of rare earths, such as zirconia, thoria, and yttria, with admixtures, in varying proportions, of other earths to graduate the colour of the light. The principal sources of

these oxides are: allanite, cyrtolite, fergusonite, gadolinite, nivenite, rowlandite, thero-gummite, yttrialite, and zircon. At Pittsburg one or more of these minerals are fused with soda in an iron cauldron heated by a blast of natural gas. Small incandescent beads appearing on the top of the fusion have been ascribed to the liberation of sodium in the reaction, but may only be bubbles of hydrogen gas sufficiently impregnated with soda to give the flame—though, on the other hand, the Castner process has demonstrated the ability of iron to reduce soda under favourable conditions. The product of the fusion consists of rare-earth oxides, mixed with some silicate of soda, which, after purification and separation, form the basis of the glower.* In order to make contact, the little balls at each end of the glower are made white hot in the electric arc by a workman, whose face is protected by a screen, and who only sees a darkened reflection of what he is doing in a mirror. At the right moment he embeds a platinum bead in the white-hot ball, and they fuse together in such wise that any tendency to shrink on the part of the glower material only makes the contact closer, and thus maintains intimate union. A lead wire is then fused on to the embedded platinum beads. This device is called the Hanks terminal. The glower is a secondary conductor, but is also an electrolyte. The presence of oxygen seems to be at least desirable. No electrolytic action is apparent when an alternating current passes, but with direct current a black deposit at the negative end of the glower spreads gradually towards the positive terminal, and the candle power and efficiency fall off. Great improvements are being made in direct-current glowers. A "ballast" or steadying resistance is required with each glower, and this consists of fine iron wire fused to platinum terminals and enclosed in a glass bulb filled with hydrogen.

Knough has been said to show the complicated nature of the manufacture when put into practice, and, seeing that nearly every detail is made on the premises, it was not to be wondered at that the visit soon passed the limits of the ordinary Saturday morning's work. The staff and employees, however, willingly remained working for the Society's benefit for half an hour longer.

All the visitors assembled at 1.30 at the Union Club on the 19th floor of the Frick Building. They were then entertained at luncheon by the Reception Committee. After lunch the party went up the Monongahela River by steamer as far as McKeesport.

An "Abschiedstrunk" terminated a most enjoyable visit to this interesting city, to which the hearty welcome given by the local members, their ladies, and friends contributed much. The thanks of the members are also due to the Engineers' Society of Western Pennsylvania and the local members of the American Chemical Society. At 10 p.m. the special train left for St. Louis.

ST. LOUIS, SUNDAY, SEPT. 18TH.

RECEPTION COMMITTEE.

F. W. Frerichs, Chairman.

Chas. E. Caspari.	Sherman Leavitt.
August H. Hunicke.	H. M. Whelpley.
Edw. H. Keiser.	

Honorary Committee.

Edw. Mallinckrodt, Chairman.

R. S. Brookings.	Chas. P. Nagel.
W. S. Chaplin.	

With a ladies' committee consisting of Mrs. F. W. Frerichs, Mrs. H. M. Whelpley, Miss Koeper, and many others.

On arrival at St. Louis the visitors were received by representatives of the local committee, the St. Louis Chemical Society, and Mr. Walter F. Reid, late Chairman of the London Section and one of the jurors. The bulk of the members remained on the train, which was placed in a siding in the exhibition grounds.

* This is made by expressing from a die a dough of rare earths mixed with a suitable binding material, cutting the porcelain-like string thus made into lengths, drying, roasting, and finally attaching lead wire.

MONDAY, SEPT. 19TH.

Members devoted their time to studying the Exposition, which covers so vast an area, 250 acres, that four days were far too few to do more than form a general idea of it. In the afternoon, many assembled in the Festival Hall to witness the opening of the Science Congress and to hear Prof. Simon Newcomb's opening address. Sir Wm. Ramsay also addressed the meeting in place of the Rt. Hon. James Bryce, M.P., who was unable to be present in time. He expressed the thanks of Great Britain for the courtesies which had been shown to her representatives who had come to attend the Congress.

In the evening the St. Louis Chemical Society gave a banquet at the Southern Hotel to the members of the Society of Chemical Industry and the other foreign chemists who were attending the Congress. Dr. F. W. Frerichs occupied the chair. Among those who were present were Sir William Ramsay, Dr. Theodor Lewald (Imperial German Commissioner), Count Limburg-Stirum, Major-Gen. Waterhouse, Col. Couburgh, Profs. Ostwald, Arrhenius, J. H. Van't Hoff, Erdmann, Oscar Liebreich, C. E. Caspari, J. M. Goad, V. Coblenz, M. T. Bogert, F. W. Clarke, Ernest Rutherford, W. O. Atwater, A. B. Prescott, and S. P. Sadtler; Drs. M. Benjamin, H. M. Whelpley, Otto Zwingenberger, R. Messel, J. Lewkowitch, R. Möhlau, J. T. Conroy, W. Hermsdorf, J. Holmes Joy, L. Rostovsky, and H. W. Wiley; Messrs. Gustave Cramer, Edw. Mallinckrodt, George Merck, C. F. G. Meyer, Theo. F. Meyer, Thos. Tyrer, Eustace Carey, Walter F. Reid, and many others. Chancellor Chaplin, of the Washington University, St. Louis, was the toastmaster, and speeches were made by Sir Wm. Ramsay, Profs. Arrhenius, Van't Hoff, and Atwater, Dr. Wiley, and Mr. Tyrer.

TUESDAY, SEPT. 20TH.

A visit was paid to the German Chemical Exhibit, and the ladies were entertained at luncheon by the ladies' committee at the Imperial German House. Dr. Chapzki gave a demonstration of Carl Zeiss' ultra-microscopic apparatus.

WEDNESDAY, SEPT. 21ST.

Sir Wm. Ramsay read a paper on the present problems of Inorganic Chemistry before the Science Congress. Prof. Moissan also addressed the meeting. In the afternoon Prof. W. A. Noyes addressed the Congress on Organic Chemistry.

Mr. J. E. Petavel gave a lecture on liquid and solid hydrogen, with experiments. In the afternoon and evening there were receptions at the French Building and at the Imperial German House respectively.

THURSDAY, SEPT. 22ND.

Thursday was again devoted entirely to the Exhibition. In the evening the Society left for Chicago. By an unfortunate change in the arrangements of the International Congress, the date of the Technical Chemistry sectional meeting was altered at the last moment to Friday 23rd. Those who wish to obtain further particulars of the St. Louis Exhibition will find them in a paper to be read by Mr. Walter F. Reid before the Society of Arts on Dec. 7th next. Mr. Reid will also discuss the chemical and pharmaceutical aspects of the Exhibition before the London Section of this Society on Jan. 9th, 1905. The list of awards to British exhibitors in the chemical and allied sections has been published on page 1014 of the Nov. 15th number of the Journal, and on page 1059 of this issue. For those who desire more general information the September numbers of the "Cosmopolitan Magazine," New York, and "The World to-day," Chicago, both devote their space entirely to the Exhibition.

CHICAGO, FRIDAY, SEPT. 23RD.

LOCAL COMMITTEES.

Executive.

T. B. Wagner, Chairman.
W. A. Converse, Secretary.
John A. Lynch, Treasurer.

C. E. Cahn.
John A. Wesener.
John H. Long.

Jacob Baur.
J. P. Grabill, LL.

Entertainment and Programme.

C. E. Cahn, Chairman.
Julius Hieglitz. | C. H. Propach.

Hotel and Transportation.

Jacob Baur.

Invitation and Press.

John A. Wesener.

Ladies' Committee.

Mrs. Theodore Brentano, Chairmah.

Mrs. C. E. Cahn.	Mrs. W. A. Converse.
Mrs. T. B. Wagner.	Mrs. H. E. Harrisou.
Mrs. John H. Long.	Mrs. C. Propach.
Mrs. J. A. Wesener.	Mrs. Alexander Finn.
Mrs. C. M. Eddy.	

The above were assisted by a large reception committee and many others, who gave willing help in entertaining the visitors.

The members assembled at headquarters, the Auditorium Annex, at 10.30, and proceeded to visit the "Board of Trade" or Corn Exchange, on which between three and four times the equivalent of the United States wheat crop was bought and sold in 1903. The First National Bank and the Illinois Trust and Savings Bank were also visited. A little before 1 p.m. the visitors proceeded to the Stockyards. These establishments cover an area of about 500 acres, and here are handled daily 75,000 cattle, 800,000 hogs, 125,000 sheep, and 6,000 horses. The Chicago Junction Railway handles the transportation with 300 miles of track, while 45,000 men are employed within the yards. Chicago deals with three-fourths of all the fat cattle marketed in the country, and packs and ships three-fourths of the meat products exported by the United States. On arrival at the yards, luncheon was provided by the courtesy of Messrs. Swift and Co. After lunch, the slaughtering houses were inspected, then the manufacture of oleomargarine at the factory of Messrs. Nelson, Morris, and Co., and the canning of foods at that of Messrs. Libby, McNeill, and Libby; while the laboratories of Messrs. Armour and Co., who make glandular preparations for therapeutic purposes, were also open for inspection. Soap, glycerin, glue, gelatin, bone, hoofs, ammonia, isinglass, curled hair, neatsfoot oil, and fertilisers are turned out in large quantities by these firms. Souvenirs of the visits were presented to each of the visitors. In the evening there was a reception in the banquet hall of the Auditorium Hotel.

In the daytime the ladies visited Marshall, Field, and Co.'s Retail Store and the Art Institute, joining afterwards in the evening reception.

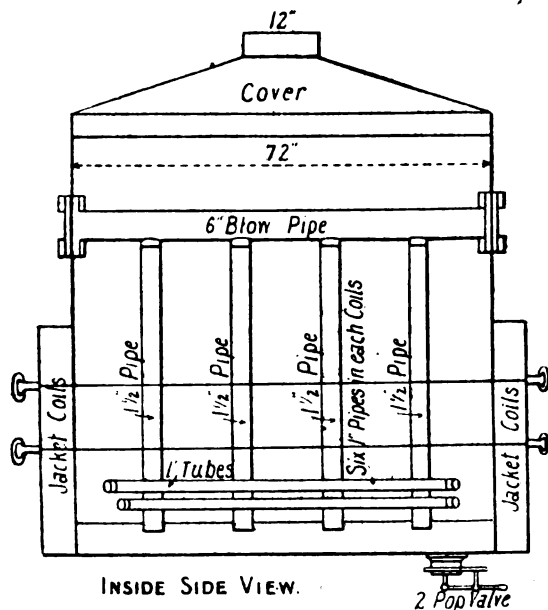
SATURDAY, SEPT. 24TH.

The members divided into several parties. Some visited the Standard Oil Co.'s works at Whiting, Ind., where the plant for the desulphurisation of the oil aroused much interest, some the Matthiessen-Hegler Zinc Works at La Salle, Ill., some the Elgin Watch Co.'s works, and some the Drainage Canal by which the sewage of Chicago is passed over the watershed into the basin of the Mississippi, whereby the death rate of the city has been materially lowered. Visits were also organised to the works of the Liquid Carbonic Co., the Illinois Steel Co.'s Cement Works both at Chicago, and the Milk Products Co., at Carey, Ill., a branch of the Union Condensed Milk Co. of New York, where oxygenated milk is prepared according to the following process, for the description of which the Society is indebted to Mr. F. L. Kneeland, a director of the company.

The Evaporation of Milk.—By an invention of Dr. J. H. Campbell, of New York, milk is now evaporated to any desired density at a temperature not above 145° F.; the accompanying diagram shows the apparatus employed. A rectangular tank is surrounded by a jacket-coil system one-half its height, and contains inside two sets of heating coils. By means of a pump, hot water is rapidly circulated through the outer and inner coils into a receiving tank, which is heated by exhaust steam, the same water being pumped through the coils again and again. A 6-in. pipe extends across the inside of the tank, near the top, and

connects with perpendicular 1½-in. pipes extending below the interior coils within 8 ins. of the bottom of the tank. By this means, a root blower drives a large volume of sterilised air into the fluid contained in the tank. If the temperature of the water in the circulating coils is 185° F., the temperature of the milk in the evaporator will be 140° F., owing to the passage of the air through it. This air, saturated with vapour, is drawn off by means of a fan placed in the opening at the top. As the air blast passes through the milk, it carries off the vaporisable impurities and destroys the bacteria in the milk. The process requires from a few minutes to two hours, according to the evaporation desired. The low temperature of the milk causes no coagulation of the casein and lactalbumin, and by adding the amount of water taken from the milk, the resultant product is normal milk, thoroughly sterilised and chemically and physically unchanged. The solid impurities are removed by a separator beforehand, and the separated cream is added to the blown skim milk only towards the close of the blowing, otherwise there would be a risk of churning.

The party which visited the Milk Products Co. travelled by special train, and then proceeded to Lake Geneva, in Wisconsin, where they were met by Prof. Barnard, and conveyed in Mr. Martin Ryerson's yacht "Hathor" to inspect the Yerkes Observatory. The dome of the observatory can be revolved at will, and the floor can be raised or lowered by hydraulic pressure. All these mechanical adjuncts are absolutely necessary; even then observations are made under considerable difficulties, especially in winter, when no artificial heat is admissible. In the library were shown magnificent photographs of star clusters and nebulae, all taken direct by the professors and their assistants. The refracting telescope weighs 20 tons, and is 63 ft. long; it is so perfectly balanced that a touch on a wheel suffices to move it wherever desired. The opening is 40 ins. in diameter, and the lens is composed of flint and crown glass. The telescope is said to have the best definition in the world. With its aid Prof. Barnard discovered the ninth satellite of Saturn, a star of the seventeenth magnitude, and established its connection with the solar system.



were reserved by the Committee for the Society, the theatre was decorated with intertwined flags, and a special programme was performed in honour of the visitors.

SUNDAY, SEPT. 25TH.

In the afternoon the visitors drove through Washington and Jackson Parks, past the site of the Chicago Exhibition and the Field Museum, to Chicago University. There Prof. Nef showed the Chemical Laboratory, and Prof. Michaelson gave a spectroscopic demonstration in the Physics Laboratory. Tea was served at the Reynolds Club, after which the party drove back to Chicago, and left for Detroit at 10 o'clock.

(To be continued.)

London Section.

Meeting held at Burlington House, on Monday,
November 7th, 1904.

MR. A. GORDON SALAMON IN THE CHAIR.

The CHAIRMAN, after warmly thanking the members for electing him to the office of Chairman, announced that Mr. R. J. Friswell had been elected Vice-Chairman of the Section.

THE TREND OF INVENTION IN CHEMICAL INDUSTRY.

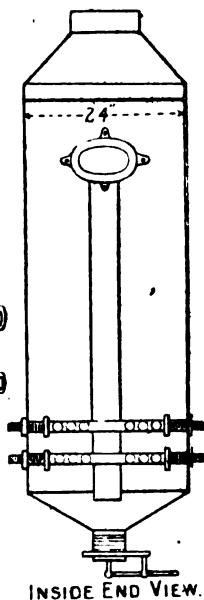
BY J. FLETCHER MOULTON, K.C., F.R.S., M.P.

When your Committee paid me the compliment of asking me to address this formidable scientific assembly, I felt the difficulty of the task even more keenly than I appreciated the honour. I knew too well the men who would form the

audience before whom I should have to speak. Throughout my professional life I have been continually brought into contact with the leaders of our scientific industries, and have learnt to appreciate the knowledge and skill they bring to their work. The position that I occupy to-night belongs naturally to them. They can speak to you weighty words of guidance as to your daily difficulties, and by the narration of their triumphs lead and stimulate you to equal successes. But one like myself, who stands outside your sphere of work, has neither the experience to guide nor the knowledge to teach. He is fortunate if only he can understand and sympathise with your labours.

And if this were primarily an assembly of chemists, these considerations would probably have led me to decline the honour. But you represent chemical industry, and not chemistry simply. Theoretical chemistry has long been the land of the chemical specialist alone, and it is idle for any

other to affect to be a citizen of it or to attempt to form an independent judgment of its progress. But it is otherwise with chemical industry. Pray do not think that I regard its sphere of effort as less worthy or less difficult than that of theoretical chemistry. But it is different. The chemist seeks after knowledge; chemical industry applies it. The



INSIDE END VIEW.

Prof. Frost described the spectrographic work, and Dr. Schlesinger explained the arrangements for direct photography. The party then returned to the yacht and sailed the full length of the lake, at the end of which they rejoined the train for Chicago.

On Saturday evening a concert was given in the Auditorium Theatre by Sousa's Band. The whole of the boxes

sole test for the one is "truth," for the other "result." That which your profession has under its charge is a part of the practical work of life, and though its leaders and workers must be skilled chemists, and derive their guidance and inspiration from the discoveries of theoretical chemistry, to which many of them have contributed so largely, they take their rank to-night by the practical success of their work, and not by its theoretic merit. The triumphs of chemical industry are economic, however much they may depend on scientific knowledge and research; and thus they are justly open to the contemplation and reverent criticism of all who study the world's work and the world's progress.

This distinction becomes clearer when we look to the forces which are at work to cause progress in these two great branches of human effort. While the one derives its development from the insatiable thirst for knowledge which, in thoughtful minds, is the splendid result of knowledge itself, the other has a far ruder but not less efficient stimulus in the unceasing, though friendly, competition that goes on in the markets of the world. It is here made to feel that its work is practical, and that, like every other branch of industry, its task is to satisfy actual needs of mankind; and its triumph can but consist in doing this well and easily. Hence, progress means that a lessened amount of human labour and sacrifice is required to satisfy such a need; and inasmuch as, broadly speaking, that amount is measured by cost, we may say that the advance to which chemical industry is continually spurred by the pressure of competition is the reduction of the cost of production—in other words, increased cheapness.

Do not think that I am taking a low view of your profession when I speak of cheapness being its aim and the test of its success. I have no sympathy with those who think scorn of cheapness. To me it speaks of a lighter burden in production and a wider possibility of enjoyment—if I may use such a term in connection with the, usually uninviting products of chemical manufacture. But while I feel how great is the advantage to mankind of this competition, I appreciate none the less fully how stern and unsleeping a master you have and how you must often groan under his sway. I know that evolution through the struggle for cheapness is not peculiar to your industry, but in no branch is the pressure so keen or the problem to which it gives rise so difficult. In none is the interworking of action and reaction so immediate or so complex. In olden days the chemical manufacturer made the one product he sought and was content. All that which was left was waste. But the pressure of competition soon drove him to seek some contribution to his working costs from that which he had previously thrown away, and the utilisation of by-products began. This has grown to such a pitch that there is scarcely a single important chemical industry that could afford to trust to a single product. Groups of products thus take the place of single products, and the production of a member of a group is linked by quantitative relations to that of the other members, and is no longer regulated independently by the laws of supply and demand. Now turn to the selling side. The needs of mankind measure the demand for your products. Many of these needs are imperative but limited. The demand does not grow with the supply. If too little is produced the price will go up to its highest limit, *viz.*, the equivalent of its value in use. If too much is produced the price will fall, and if by reason of its being a by-product, that production cannot be checked there is no limit to such fall. A change of process may glut the market in some article which has become a by-product, and may send it to a nominal price. The manufacturer has to steer his way among all these difficulties, and, verily, his task is no light one.

I do not know whether his hopes or his fears trouble him most. The selling price is ruled—in the absence of disturbing causes—by the ordinary cost of production. Hence, the pioneer who introduces and works a cheaper method, reaps the difference of cost of production as his reward so long as his method remains exceptional. But the exceptional of to-day becomes the ordinary of to-morrow and brings about a corresponding readjustment of prices, so that the old methods must be abandoned if manufacture is to bring any profit at all, and fresh progress must be

made by those who seek exceptional returns. It is this which makes the work of the chemical manufacturer so arduous. Chemistry is too rich in possibilities. The stimulus to advance is keen and the opportunities for it numerous, and when a genuine advance is made all must follow—if not to get the pioneer's reward, at least, to escape the laggard's punishment.

To-night I have to deal with the advance made in this restless field of human effort under this unceasing stimulus. As you will suppose, I find no lack of material.

To give order to my remarks, let me analyse for a moment the forms in which advance may be made in the domain of chemical industry. Like every other department of industry its province is to satisfy practically the wants of mankind, and the aim of those who direct it is to do this as cheaply and in as efficient a way as possible. Hence advance may consist in its extending the scope of its manufactures by taking in new products to satisfy new wants, or more effectually to satisfy old ones. But chemical industry must seek somewhere the necessary materials for its manufactures, because chemistry does not create matter, it only rearranges it, and therefore advance may consist in the choice of new sources from which those materials are derived. These are no doubt two important types of advance, but at the present moment the main line of advance of chemical industry is not to be sought in the list of its products or the sources from which its materials are derived, but in the improved method by which it works. It is in these three divisions I shall consider the subject, *viz.*, the trend of invention in—(1) the products, (2) the sources of material, and (3) the processes of chemical industry.

So far as new products are concerned, the present moment is specially characterised by the initiation of a crowd of small manufactures. No epoch-making change is manifesting itself. This is natural. Some 30 years ago two gigantic chemical industries took their rise, *viz.*, that of modern explosives and that of coal-tar dyes, and the world has ever since been working out in detail the almost revolutionary changes they brought about. I do not suggest that their fertility in new products is checked. New explosives are still being introduced, mainly such as are designed to meet the special difficulties of particular uses, such as the flameless explosives for coal mines, or the almost detouring explosives which can yet stand safely the shock of being fired in shells. New dyes are constantly being invented, and the names of fear which they bear become more terrible each year. But the triumphs of these great industries in the past have been so magnificent that no developments of to-day can overshadow or displace them, and the description of their growth in recent years, however sound and vigorous it may have been, would consist of a detailed list of products wholly beyond the scope, and foreign to the nature of this address.

One victory, however, of the coal-tar dye industry cannot be passed over, and that is the commercial manufacture of synthetic indigo, which has taken such proportions, that it threatens to supplant the natural product, and produce far-reaching economic consequences in our Indian Empire. It is the greatest industrial triumph of synthetic chemistry, and one hardly sees where it will find another like conquest to make. Its history illustrates well how independent, and yet how inter-dependent are the domains of chemistry and chemical industry. It is properly classed as an invention of to-day, although the synthesis of indigo has been possible to chemists for some years past, for it did not pass into the domain of chemical industry until a long series of improvements in the processes for its production, made under the stimulus of industrial development, enabled it to compete in cost with the natural dye.

In my opinion, however, there are two departments in chemical industry, which are of great interest at this moment from the inventive development they manifest in their products. The first is that of pharmaceutical products. A field of research and its practical application is here opening out, the importance of which it is difficult to estimate, but which may be very great. I say this, because one can see, though perhaps as yet only dimly, and with little clearness of outline, the rise of great principles such as those which gave birth to the great chemical industries

of which I have just spoken. Physiologists are beginning to associate specific effects on the human organism with specific chemical groups. These groups appear in countless combinations in organic chemistry, and their effect may be masked or hindered by the setting in which they are placed. This may arise in many ways. It may be that their effect is produced in the body by their being set free to form new combinations, so that too great stability in the original substance will paralyse them. It may be that their effect is produced by the selective absorption which is so characteristic of the organs and tissues of the human body, and in such cases the overlading of the molecule may render them inert. Again, it may be that the setting of the group, the combination of atoms with which it is associated to form the molecule may itself be capable of producing conflicting or otherwise deleterious effects. In all such cases the group may be present without producing the characteristic result. But the belief is growing that the tendency of the group to produce its specific effect is real and inherent, and that with a right choice of its setting it will produce it without these extraneous effects. It may well be that we are still in the infancy of pure therapeutics. Few drugs are known which, side by side with the effects they are intended to produce, do not bring with them other consequences, unsought for and often undesirable. So far as these take their rise in the organism as a physiological consequence of the original effect they must be accepted. But physiologists are raising the question whether it is certain that they are of physiological and not of pharmaceutical origin. It may well be that many of the forms in which the effective groups have up till now been administered, have influenced and distorted the normal action of the group itself, and a line of genuine research and invention is being pressed forward, seeking practical solutions of the problem of the best way to use these operative groups. Taking at hazard a concrete example, let me instance the salicylic group which is so potent, but the effects of which on the heart are held in many cases to prohibit the use of it in its ordinary forms. It is claimed now that if, instead of administering it in the shape of salicylic acid, or its salts, you take it in an acetylate setting as salicylic-acetylate, those ill effects are not produced. I am not concerned with the question whether this has or has not yet been demonstrated, but, assuming it to be so, it gives a clear instance of the nature and object of the research to which I am referring. It has already given rise to the discovery and manufacture of a large number of new pharmaceutical products, many of which have been looked for and found by applying the principles I have outlined. Unfortunately it is difficult to prophesy how many of these new manufactures will live. Some have won for themselves a permanent position, but in a department where experiment is so difficult, progress cannot be at once rapid and certain, and, indeed, the chief difficulty in forming a correct opinion on the subject is that in the case of pharmaceutical products, invention too often does not cease with their manufacture, but extends itself to the results of their administration.

The other department of chemical industry to which I wish to refer in this connection is that of foodstuffs. In my opinion the present moment is characterised by a very serious attempt, in a variety of ways, to stop the vast waste of nutritious matter that is going on all around us. There are two forms of this waste. On the one hand, with the exception of cereals, foodstuffs are essentially perishable articles, the preservation of which by existing methods is often more costly than their production, and they are wasted because they cannot be used where and when they are produced. On the other hand, there are many substances treated as waste which would be capable of giving nutrition if they were in a form suitable for assimilation. I would cite milk as an example of the first of these classes, and yeast as an example of the second. Now it is a very worthy aim of chemical industry to stop this waste. It may be an excellent advertisement for an extract of beef company to represent an ox as squeezed into a small earthenware pot, but to the industrial chemist the very existence of such a caricature emphasises the awful waste that is accepted as necessary in order to preserve even any portion of the food. How great would be the consequences of an advance in this department can be

measured by the economic value of the system of cold storage at the present time. It would stagger those who have not made a study of the subject to figure out the monetary importance of this system in its present applications, although they are still crude and imperfect in many respects, and need, and will, I think, undergo, great improvement.

The past history of this branch of chemical industry has not shown many successes of which we need be proud. Chemical preservatives are loved but little, and enjoy a social status not much above that of the criminal classes. The difficulties of the problems that present themselves are immense, but personally I think we are at a moment of real advance. For instance, I believe that milk will soon cease to be a perishable article so far as its substantial use for human food is concerned. I should like to see a substantial part of the ability, which is devoted to the practical solution of difficult chemical questions in our existing industries, applied to the preservation of foodstuffs. With one or two exceptions the men who have best succeeded in this department have done so rather by their practical skill and good sense than by their technical knowledge, but I can myself see a change coming, and I hope that I am not wrong in considering it as one of the directions in which invention is about to be most vigorous. It is the great boast of the leaders of our chemical industries that waste has been banished from their factories, and I trust that they will not long be content to see going on around them this enormous waste of that which is necessarily in most universal demand.

These new manufactures, though important in themselves and still more important in their aggregate, are, after all, in point of scale, only the fringe of chemical industry. The main chemical wants of mankind are almost as stereotyped and unchanging as its staple foodstuffs. The overwhelming importance of the alkali industry or of that of sulphuric acid will not materially alter, whatever be the developments in our industrial products. Hence it is that the list of the great chemical industries is so rarely added to. It is rare to find a new want which gives rise at once to a great manufacture. The only approach to this state of things, at the present time, is the cyanide manufacture, which has grown so suddenly to the proportions of a great industry that it almost merits a place in the list of new products. Before 1895 the annual production of cyanides in the world was below 500 tons. Now it amounts to about 8,000 tons. This is entirely due to the MacArthur-Forrest system of gold extraction, to which the world owes the recovery of some 9,000,000 of ounces of gold from its ores, and it is a worthy example of the obligations of chemical industry towards inventors. The demand has been met by the invention and practical introduction of new and ingenious processes of manufacture which have wholly superseded the old methods, and though I do not propose to refer further to them in this connection, they illustrate the abundant resources of chemical industry to deal with newly arising demands.

I turn now to the sources from which chemical industry derives its materials. Here development depends on purely industrial considerations. For the purposes of inorganic chemistry the possible sources from which each element can be obtained have long been known, and organic chemistry has full reason to be satisfied with the inexhaustible mine furnished by our gas industry. But although there is little addition to our knowledge of possible sources, there may come from time to time a shifting of the industrial source from which some element is practically obtained. Take your minds back to the momentous change, extending through the length and breadth of chemical industry, which took place when pyrites were substituted for brimstone as the industrial source of sulphuric acid. The reduction in the cost of producing that king of reagents was not due solely to the fact that fresh sulphur-bearing deposits of enormous extent were made available, but also to the fact that thereby the production of sulphuric acid became linked with, and formed a step in, metallurgical operations themselves of great industrial importance, so that the development of the two industries thereafter went hand in hand, and each shared in the prosperity of the other. Are we on the eve of any such change as this? Not in respect of any element

strictly so-called. But it may be so in respect of something that merits to be considered an element from an industrial point of view. I refer to combined nitrogen.

We all know that nitrogen is the element which is present with us in the greatest and the most useless abundance. It forms five-sixths of the atmosphere, and yet this huge store of nitrogen is substantially useless for practical industry on account of the difficulty of inducing it to combine. But so soon as it is combined it is one of the most tractable of elements. It can be made to pass from its most fiercely acid form of nitric acid to its most alkaline form of ammonia, and through countless intermediate combinations without any attempt to escape from the bondage into which it was so reluctant to enter. It is like the wild horse of the fairy tale that had but to have the magic bridle thrown over him to become the most manageable of steeds. Therefore it is that for industrial purposes we must consider the sources of combined nitrogen rather than those of nitrogen itself, and in this sense combined nitrogen is industrially an element of the widest possible usefulness. In the form of ammonia it is one of those substances to the use of which no limit can be assigned, because it approximates to the position of a food stuff by reason of its manurial value, so that it is hardly possible to think of any abundance so great that it would exceed the demand, provided the price of production be low enough.

It is in connection with combined nitrogen that there is the promise of such a change of source. Important as is the use of pyrites ores it is small in economic importance compared with the generation of power. Engineers have never forgotten the prophecy of the late Sir Frederick Bramwell, that the steam engine would in fifty years be found only in museums, and even though that prediction be somewhat poetic in its phraseology, it is based on the prose fact that the use of the internal combustion engine is developing with a rapidity which promises soon to make it the main source of motive power. To realise the presence of ammonia as an available by-product in the manufacture of gas for such engines, and to work out a practical process which will substantially extract the whole of that which is present in the waste products of combustion in such a manufacture, is to open out a source of combined nitrogen on the most gigantic scale, growing with the growth of all our industries, and specially adapting itself to that tendency to concentrate the generation of power which has followed the development of electricity as a distributing agent. This has been the work of Dr. Ludwig Mond. It is too early to speak of its results, but if the practical and commercial success of the Mond process can be fully established, so that it normally forms part of our power plants, we may expect a change of great and wide-reaching character throughout many branches of chemical industry, similar to, but even more important than, that which followed the substitution of pyrites for brimstone in the sulphuric acid manufacture.

Side by side with this bold endeavour to collect ammonia as a by-product of the production of motor gas, humble, but still, I think, successful efforts are being made to solve the problem which has been attempted so often of getting it from the nitrogenous contents of peat. These attempts are complementary to the work of Dr. Mond and the gas companies. So far as I can see, it is probable that we owe all the combined nitrogen of the world to the patient but humble work of bacteria through the long prehistoric ages, and our business is to recover it from the remains they have left. This combined nitrogen is mainly stored up in coal and peat, small as may be the actual percentage present in these substances, and the choice of these poor but extensive sources of ammonia illustrates the present tendency of invention. The most paying gold mines are those which have an abundance of low grade ore. So is it here. The improvements in plant and the advance in the skill with which it is used have led to a preference for sources which are large in scale over those that are small, even though rich and easily worked. To take infinite trouble to secure success on a large scale is the characteristic of modern developments in industrial chemistry.

But, as I have already said, the main advance in chemical industry is in the processes used. Indeed, the fertility of

invention in this respect is so great that it is bewildering to anyone who is striving to classify it or to detect its dominant tendencies. This is especially the case in organic chemistry, where, side by side with the ceaseless stream of new substances, there is poured forth an equally ceaseless and even more abundant stream of new processes for making known ones. Complex molecules are arrived at from different starting points by different routes through different intermediate products. Now one part of the structure is built up first, and now another. Is it possible to detect any definite trend or direction in all this invention?

We must not lose sight of the fact that we are dealing with industrial chemistry, and that, therefore, the invention that concerns us has been developed under the stimulus of competition with a view to obtain economy of production. No doubt there are cases where this is obtained by devising or modifying a process so as to utilise some by-product or cheap raw material. But apart from such cases I think there is a tendency, or perhaps I ought rather to call it an aim, which is so general, that it may fairly be regarded as characteristic of the advances of to-day, taken as a whole. It relates to the question of yield. Both in the modifications of existing processes, and in the choice of new processes, the aim is to increase yield by more perfectly producing the conditions that make for it. It is based on a belief that imperfect returns are due in large measure to our own fault, and that with greater knowledge, and more skilful use of it, the partial successes which now content us could be made complete. Let me try to make my meaning clear.

Consider for a moment a chemical operation which yields various products, one of which is the one sought. Assume that the yield is found to vary. The aim of the chemist is to induce the necessary elements of the combination to be unanimous in arranging themselves so as to form that product, and in avoiding the alternative arrangements which are open to them, so as to give what is known as the theoretical yield. Now in most cases, if not in all, it would be dangerous to dogmatise as to what are the actual chemical changes which go on in producing what are to us the results of the combination. Many steps may intervene in the shape of momentary intermediate combinations, which form the paths to the ultimate products. But it is clear from the variations in the yield that those paths must be so nearly equivalent as alternatives, that very slight variations in the surrounding circumstances will decide in the case of the individual molecules whether they will take the one path or the other. On the break up of the original groupings "moments of molecular indecision" (if I may use such a phrase), evidently occur during which the presence of an otherwise insignificant influencing cause may decide the behaviour of the molecules, and thus determine the ultimate result of the combination.

Let me illustrate my meaning by an example. I will take the manufacture of the toluol sulpho-chloride from which saccharin is ordinarily produced. It was well known that sulpho-acids and sulpho-chlorides could be formed directly from toluol by the action of chlorhydrin, but only a portion of the toluol was thus turned into sulpho-chlorides, and of these only a portion consisted of the ortho-sulpho-chloride—which was the body sought, the para-sulpho-chloride, an isomer of no industrial value, being present in substantial quantities. By using an excess of chlorhydrin, it was found that a total conversion of the toluol into sulpho-chlorides could be obtained, but this helped little inasmuch as the early results showed the chief product to be the useless isomer. But Monnet found that if while using this excess of chlorhydrin you kept the temperature below certain limits you could cause the useful body to be produced in preponderating quantity. This discovery caused the commercial yield of the useful product to rise from 25 to 60 per cent., and diminished the cost of the manufactured article by nearly one-half.

Here we have a striking example of the existence of alternative paths. The two resulting products are isomers, i.e., identical in chemical composition though not in chemical structure. They differ only in the orientation of the entering sulphochloride group, and on that depends whether the result is useful or useless. We know little or nothing of the forces that determine into what position the group

shall go, but the conditions that decide for the one or the other must resemble one another so closely that they are both present in the same mixture, under the same external circumstances. The yield is composite, yet there is no ground for supposing that under identical circumstances there would be any variation in the behaviour of the different sets of combining molecules. The variation in the yield must therefore come from slight but decisive variations in the momentary local conditions. It is this which constitutes the difficulty of the problem, *viz.*, that such slight variations of the circumstances that attend the combination of individual sets of molecules can produce such grave practical consequences.

I will take the example one step farther. It has since been discovered that these limits of temperature may be considerably relaxed, if instead of technical chlorhydrin, you use such as has been raised to a high state of purity. Thus between the old and the new limits of temperature we find that the place taken by the entering sulphochloride group is changed from the useful to the useless, from the ortho to the para position by the presence of small traces of impurities, chiefly, I believe, sulphuric anhydride. Now, suppose for a moment that it had been the para body that had been of industrial value, we should here have a case in which the addition of a small amount of sulphuric anhydride—a body having apparently no connection with or relation to the reaction—largely increased the industrial result by influencing, in the right direction, the choice of which of the two alternative paths the combining molecules should take.

The example I have chosen recommended itself to me solely because it happened to come under my notice in my own professional work. Far better instances will occur to the skilled chemists before me. The case is now classical in which the yield of a difficult reaction in the synthesis of indigo was suddenly and unexpectedly increased, and this desirable result was traced to the fact that the mercury thermometer used in the operation had broken and thereby introduced a minute quantity of sulphate of mercury into the combining mass. Such a history makes one almost believe in the truth of the story one was told in childhood about certain pieces of imperial Nankin china preserved in the Summer Palace. The story ran that they owed their surpassing beauty to the addition—trifling from a purely chemical standpoint—of the master workman to the contents of the furnace in which they were being burnt. Cases such as those to which I have referred are not rare. Again and again I have had inventions before me of this type. Even the nomenclature of chemistry recognises them, and the term of "catalytic action" is applied freely wherever it is found that the presence of a foreign body influences reactions in which it apparently takes no part. But catalytic action is only one special case of the results of comparatively small influences at critical moments of molecular rearrangement. Any variation in the surrounding circumstances may determine a choice which may be permanent and irrevocable.

I have said that the fact that slight variations in the surrounding circumstances may have such grave consequences constitutes the difficulty of the problem. But it also constitutes its hopefulness. It is clear that the conditions of success are close at hand. We only need the skill to secure them. There is everything to make us believe that we are here pursuing no dream, but are striving for the practicable. If we compare the knowledge and hopes of to-day with those of, say, five centuries ago, we must feel that we can do things utterly undreamt of then, but that much at which they hopefully laboured is not only unattained, but is known to be unattainable. Science adds daily to the list of the practicable, but side by side there grows a still longer list of the things that she pronounces impossible. To the fancy of that age nothing seemed beyond hope. All achievements seemed worth attempting. But we have become wiser and sadder. We have become aware of the walls of our prison house by knocking up against them, sometimes very roughly. The hopes that had supported centuries of search after perpetual motion were scattered for ever by the discovery of the first law of thermodynamics. The hope and aim of all mediæval chemistry, namely, the transmutation of metals, is made more and more clearly

impossible by all the discoveries that have taught us so much of the probable identity of their substance. In every branch of practical science we know that sharply marked boundaries exist over which we cannot step, and within which all our work must lie. To disregard these would be to show the worker to be mad. I know that besides those definite laws which have already been formulated, there are others which experience has indicated, but has not accurately ascertained, which it would be unwise to disregard if one would not labour in vain. But in the endeavour by uniformity of conditions to better the practical results attained, there is nothing which should lead us to expect failure, and though, in some instances, it may be found that laws at present unknown to us stand in the way of complete success, the cases in which this is probable are not so numerous as to discourage the prudent worker.

This is to my eye the main trend of invention in chemical industry—rendering certain and complete in their action processes formerly unmanageable or unprofitable by reason of the uncertainty of the reactions that actually and locally took place. Oftentimes this uncertainty grew during the process; the processes worked well at first, but gradually became worse. Others would work in the laboratory, but broke down when tried on a large scale. In others the working loss of some costly reagent was too large. I designedly class this under the same head. For working loss is only negative yield. It signifies that the recovery process is failing to give its full results, and the causes at work and the considerations to which they give rise are the same whether the product sought be a reagent to be recovered, or the direct object of a manufacturing process. The most important and most solid advance that is being made in chemical industry consists in turning these failures into successes by securing certainty and uniformity in the conditions present at each point of the reacting mass throughout the operation.

The realisation of the necessity of uniformity of conditions, in order to obtain full yield, manifests itself not only in the efforts that are being made to improve existing processes, but also in the choice of new ones. That process is a good one which permits the necessary conditions for right choice to be secured at every point and every moment. Here come in the two most common causes of industrial shortcomings. The result of a reaction is the sum total of the results at each point of the mass. Whenever, therefore, there is the possibility of a wrong choice that is irrevocable, the conditions must at no point be such as would lead to it. However narrow the margin between that which would lead the molecules to a right, and that which would lead them to a wrong choice, it must not be overstepped at any point. Average conditions do not determine the result, for it is the sum of local actions each depending on its own local conditions. And, further, this must be maintained throughout the operation. The changes which the operation itself works must not so alter the local conditions that they transgress these limits. Those processes, therefore, are to be chosen where there is a large margin of safety between the conditions which bring failure and those which bring success, where the local conditions are capable of due control, and where the changes due to the reaction itself are either non-injurious or can be kept in check.

Let me take, as an example, the new developments in the manufacture of sulphuric anhydride—new as far as public knowledge is concerned, for there has never been any published account of the process which the well-known English chemists, Messrs. Squire and Messel, have worked for many years at Silvertown. The reaction by which the sulphuric anhydride is formed is an old one—sulphuric acid and atmospheric oxygen passed over platinum black at a fairly high temperature combine to form the anhydride. But though the reaction had long been known to chemists, and had often been proposed as an industrial process, it had failed to win a place in practical manufacture. The results were uncertain, and after a comparatively short run the combination usually ceased to take place. It is now known that one cause of this failure was the difficulty in preserving uniform the local conditions in the contact mass. The action of platinum black depends on its intimate structure being unclogged, and above all on its being untainted with

arsenic. Minute traces of dust or solid impurity or of arsenic, even in gaseous form, are fatal to it. But there was another cause of failure of even greater interest. The difficulty of alternate paths here presents itself in a curious form. The reaction is itself reversible. At temperatures well within the limits between which combination can take place, the sulphuric anhydride, though successfully formed, resolves itself back into its components, oxygen and sulphurous acid, and this reverse action becomes more and more energetic the higher the temperature, and the greater the percentage of sulphuric anhydride present. Now the combination itself liberates considerable heat, so that this is a case in which the two products of the reaction—heat and sulphuric anhydride—by accumulating, tend to increase the energy of the reverse reaction. Success thus leads the way to failure. Years of work were worthily spent by Dr. Kneitsch in the complete solution of this great industrial problem. The pyrites fumes cooled, and purified to an almost ideal freedom from solid impurities or arsenic, are made to pass round and then through the tubes that contain the contact agent. They thus become raised to the necessary temperature by drawing off the heat given out by the reaction. The combination is made complete by having a long range of the contact mass, and the sulphuric anhydride that is produced is kept from accumulating by the stream of gas being passed at a proper velocity through sulphuric acid of that particular strength which has the property of instantaneously absorbing the anhydride. The result is a process which will work continuously for months and years in place of the previous unsuccessful attempts, and the difference is due to the fact that the necessary uniformity of conditions is secured. Even the difficulty introduced by the reversibility of the reaction is turned to account. The reaction is fiercest near the entering end, and there it is difficult to prevent undue heating. But thanks to the reversibility of the process, the mischief thus done is subsequently undone in the passage through the long and less intensely heated column of contact mass that follows. Thus the limits of safety at any point are widened, and the efficiency of the process is no longer imperilled by local irregularities of temperature. I want no better example of the tendency of the invention of to-day to develop processes in which certainty and fullness of yield are obtained by securing uniformity of conditions throughout the operation.

In considering chemical combination from this point of view, *viz.*, how to direct aright the choice of each molecule, one is at once reminded of the force that is so characteristically a director of molecules—electricity. Is there any evidence of progress in the application of chemistry to chemical industry? A few years ago men's minds were full of expectation in this respect. The greatest of all the chemical industries—the alkali industry—seemed at the mercy of the new method, and people spoke confidently of the abandonment of the older processes, and of obtaining all our soda by electrolysis. These bright anticipations have been only imperfectly realized. Certain forms of the process have, after long and expensive apprenticeship, established themselves commercially, and in any discussion as to the future of the alkali industry, electrolytic production must be taken into account as a factor. But the supremacy of the older methods, as measured by their comparative production, is as yet unchallenged, and personally it seems to me that of late the Le Blanc and Solvay processes have gained rather than lost ground through the increased demand for their by-products. Opinions will differ as to the reason why the success of electrolysis in the alkali industry has been so limited. I attribute it in great measure to the difficulty of preserving uniformity of conditions throughout the operations, and I am strengthened in this view by the fact that the two forms of the process which have met with the greatest practical success with us are those in which the conditions are not altered during the process, but remain unchanged, the products formed being wholly removed. But if the advance is not rapid in this department of industry, I see evidence of steady progress in the use of electrolysis at high temperatures, especially in electro-metallurgy. I am not forgetting the disappointments that have attended many promising processes of electrolysis of fused salts. But these were mainly due to

technical difficulties arising out of the new and unfamiliar conditions. Equally great difficulties have been surmounted in processes of older standing, and these will in like manner be ultimately conquered.

The most disappointing branch of this department of chemical industry is the slow advance of the industrial applications of electricity in connection with organic chemistry. It is, of course, easy to see why metallurgy and alkali-making were its first applications. In them it has only to separate an element—a metal—from the electrolyte, and for that it is specially adapted. But the results of electrolysis on a solution containing elaborate coal-tar products can hardly be foreseen. The rude violence which can safely tear an element from its inorganic combinations, may make sad havoc when applied to these complex structures. It may be counted on to produce strong oxidising or reducing action, but nothing but experiment can decide what the ultimate result will be. I have long expected great developments in this direction, but I hear of few of industrial importance. I suspect that one cause is that to which I have already referred—the difficulty of maintaining uniformity in the contents of the cell. The products of the process remain in the electrolyte, and continually alter its composition. If the yield is to be a full one, these contents must be profoundly different at the end of the operation from what they were at the beginning, and secondary decompositions are likely to arise. I have still great hopes, but whether from the cause I have assigned or not, electrolysis has not up to the present time taken its expected place in industries dealing with organic bodies.

There is, however, another gift of electricity to chemical industry, the value of which is daily becoming more highly appreciated and around which inventions cluster thickly—I mean the electric furnace. It has been rightly said that electricity enabled man for the first time to concentrate, in the form of heat at any point, and in any quantity, energy generated elsewhere. It abolished, therefore, the limitations of temperature which necessarily attend combustion. The bodies exposed to its action could be isolated from the disturbing influences of chemical action, and, indeed, in the form introduced by Moissan, and in that in which the heat is radiated from incandescent carbon rods, the bodies are shielded even from electrolytic action. Already it is the basis of important industries, such as those of sodium, phosphorus, carbide of calcium and carborundum. It specially lends itself to combinations which are endothermic. The heat can be used economically owing to its being concentrated on the bodies operated on, and to its being subject to accurate control. The one great drawback is that you derive your heat from motive power, which usually is itself an expensive product of combustion, but this makes it suitable for use in connection with the water powers that are now being utilized in all parts of the world.

I have now laid before you what, to my eyes, is the trend of invention in chemical industry, whether in its aims, the sources of its materials, or its processes. You will, perhaps, ask yourselves why I use the term invention, and where I draw the line which marks off invention from that judicious use of means and apparatus which fairly belongs as of right to everyone. I am not anxious to treat the advances in your great industry as the subject of legal subtleties, but I feel that I ought to express my personal opinion, that as practical result is the test of success, so it ought to be the main factor in determining the existence of that novelty which our laws hold to merit protection. The step between the discovery and the utilisation of a reaction is the most useful and often the most difficult step in the initiation of a successful manufacture, and should be, and I think generally is, recognised as having a correspondingly high claim to be regarded as invention. Speaking for myself, let me assure this assembly of practical chemists that my own appreciation of your efforts, your difficulties and your successes, is in entire sympathy with the views of those workers who, feeling how great is the work before them, have but one standard by which to measure the value of a new process, *viz.*, by how much does it enable them better to do that work.

DISCUSSION.

Dr. LUDWIG MOND said it had rarely been his good fortune to listen to a paper, so full of suggestion. He agreed with everything of importance which Mr. Moulton had brought forward, and more particularly with the remark at the end of the paper in which the author referred to the value of the work done by the man who worked out a discovery into a practicable manufacturing industry. There might not be many there that evening who were present at the first meeting of the Society when he brought forward some views on the Patent Laws in general, but those who were, might remember that he dwelt at some length on this very question, and made some suggestions for an improvement in the law.

Prof. CAPPER said it was impossible to criticise a paper like this off-hand, and, as an engineer, he felt great diffidence, for he was aware that in the development of chemical industry, probably more than in any other branch of industrial development, the chemist and the engineer were both concerned, and the difficulty was to keep the two apart and prevent the one swallowing up the other. The engineer suggested to the chemist that he wished to find out more completely the efficiency of his engineering plant—that he wanted to be able to analyse more precisely the gaseous products of his gas-engine, and the chemist gave him information which obliged him to entirely reform the whole of his gas engineering. He had to scrap all his plant, and to start afresh; and he found that the lines on which he had been developing before were in some respects radically wrong. But, on the other hand, the engineer sometimes had his revenge. Dr. Ludwig Mond had suggested a method by which an internal-combustion engine might, and probably would, in a short time altogether replace the steam engine as a prime mover. Immediately Dr. Mond had shown that, the engineer at once became a producer of ammonia, and therefore, to a certain extent, cut out the work of the industrial chemist. In a case of that sort, the question was how far was it wise in an engineer to develop his knowledge of industrial chemistry, and how far was it wise for an industrial chemist to become an engineer. Probably the best method was to try to live in harmony one with the other, and to take the suggestions of the industrial chemist to help to develop the engineering undertaking. A case recently came under his notice in which an engineer asked a chemist to give him a metal which would have a very minute coefficient of expansion, for producing standards, and the result was the chemist supplied him with a metal which opened out great possibilities, and would probably entirely reorganise engineering industry in working to minute fractions such as they had never had before. Electricity had been referred to, and it seemed to him that one of the great reasons why the use of electricity in chemical industry had been confined to the comparatively small field it had at present was that the engineer had not been able to give the chemist what he demanded, *viz.*, electricity at a very low cost. Now that the demand was rising, there seemed a hope of getting to the position, by the help of the industrial chemist, in which they would be able to supply electricity at a fraction of 1d. per unit, instead of the multiples of 1d. which were the rule at present; and probably the efforts of the industrial chemists using electricity would enable them to reduce the cost still farther.

Prof. J. M. THOMSON congratulated the Society and the Chairman on having induced the author, occupying an entirely different sphere, to put his ideas before the members of the Society, in an aspect, perhaps, somewhat different from that in which they were sometimes inclined to regard them.

The CHAIRMAN informed the meeting that Sir William Ramsay had written to express his regret at being unable to be present that evening.

Mr. DAVID HOWARD said it was many years since first he had to do with industrial chemistry, and he could emphasise the truth of the conclusions arrived at by the author and the reasons given for them. It was on those lines they ought to look for progress. The distinction between the purely theoretical and the practical was one which they had constantly to bear in mind. There was a wide distinction between

a theoretical result, which was often of profound interest, where 5 per cent. of the theoretical yield was most satisfactory, and the process which had to be worked out on the large scale, when 95 per cent. was a poor result. They had had the great privilege of hearing one who, not content with the glorious certainties of the higher mathematics and the glorious uncertainties of the law, had brought to bear on their industries a clear preception of their needs of which many of those who are at work upon them were only dimly conscious. The one thing they had to warn one another against was that narrowing up of their studies into the minute point which was before them—that microscopic point of view which was so tempting and so prominent. It was by that wide grasp—bringing to bear on a new subject the ability and experience of studies widely different—that great progress was made, and they would have great chemists just in proportion as they were not chemists and nothing more.

Dr. DIVERS expressed his admiration of the paper, and full agreement with the views of its author.

Mr. WALTER F. REID said this was a paper which certainly should be in the hands of every industrial chemist and every inventor, whether chemist or not. It contained many pieces of advice, the result of long practical experience, which could not but be useful to any inventor, and he might say he had learned much from it. Recently he had met with some hundreds of inventors at St. Louis, many of whom were too sanguine, and he could only have wished that some months previous to the opening of that Exhibition they could have had a copy of this paper, for he thought it would have saved the juries much trouble. But at the same time there was one word to be said about the sanguine inventor, especially in the United States. Where they in England made scientific experiments on a very small scale, there they made them by the ton. In experimenting on a large scale, enough product could be obtained to send out many samples, thus the material would become known, and other people could try it. For instance, the increase in the consumption of carborundum was enormous. Until two or three years ago it was regarded simply as an interesting chemical. Last year 2,500 tons were manufactured, and the consumption was increasing so rapidly that it might very likely be doubled this year. That showed the advantage of doing things on a rather large scale. Not everybody could afford it, but it was to be encouraged. Some of them had seen the gigantic factories which were being erected at Niagara for making use of the water power. Hitherto caustic soda had not been produced there on the industrial scale, but he was informed of a close approach to the economic production of caustic soda on Niagara Falls.

The question of new industries was one which might entirely upset not only the politics of a nation, but the whole economy of nations. Thus, in the war in the East they saw an enormous loss of life, and it was found that those who were defending their lives could not even locate the batteries by which they were attacked. When he was first connected with explosives, the difficulty was to hide a battery, now there was no difficulty at all. Again, with regard to the use of explosives, there were possibilities undreamed of when these things were first used. A curious case happened in St. Louis. A complaint was made by the owners of some incubating apparatus, that the chickens were spoiled by the detonations from two shows there. The whole atmosphere reverberated with explosions at times, and when these chickens came out of the eggs, some remarkable monstrosities resulted, showing a certain amount of distortion of the chick which was attributed to the explosions. Here was a new modification brought about in the processes of nature by a chemical reaction. In the same exhibition were shown some modern anaesthetics which were of a striking nature. He was assured in one case by an eminent French professor and other authorities that a patient could be anaesthetised sufficiently for an abdominal operation by using six drops of a 1 per cent. solution of the anaesthetic. The manufacture of such preparations frequently produced serious effects on the workmen employed.

Cold storage had completely revolutionised the food of mankind. They now got products from distant places to an extent that formerly was never dreamed of. In the United States cold storage was reduced to an art. He had had to judge apples of last year which were placed side by side with this year's apples, and it required a greater expert than himself to tell the difference. The chemist and the engineer had worked together to effect this; neither the chemist nor the engineer alone could do it, but both together they had done it, and it was one of the greatest advantages of our Society that it brought the two together.

Whilst in America he obtained some interesting information about sulphur. There was a large production now in Louisiana by a process of melting the sulphur in the earth. There were large deposits of sulphur there, but they had never been worked because of the difficulty and expense of sinking shafts and mining. Now water was heated to above 300° C., and passed into the earth, the sulphur being melted and pumped into tanks, where it solidified. This was a new process, which would doubtless have considerable influence on the production of sulphur.

It was open to some doubt whether all the combined nitrogen existing on the earth was due to bacterial action; some of it was at least due to electrical action. He thought probably a large proportion of nitrate of soda owed its origin to electrical discharges in the atmosphere.

The author had very rightly referred to the extreme importance of infinitesimal quantities in chemical reactions, and one of the most valuable portions of the paper was that in which he showed how extremely minute a quantity of a substance might altogether alter an expected reaction. Mr. Watson Smith had shown them not very long ago how, in testing aluminium, the test tube itself played the part of a reagent; that small quantities of material were dissolved from the test tube and affected the reaction so much that previous experiments on metallic aluminium with different solutions were rendered practically valueless.

With regard to the reactions taking place at different temperatures, they stood in face of an enormous revolution in chemical industry. The production of liquid air gave them opportunities of using low temperatures in chemical reactions in a way they had never been able to do before. It might interest those present to know that the largest quantity of liquid hydrogen ever produced in one day was turned out, one day last September, by the Low Temperature Research Apparatus at St. Louis, which had been sent out and erected by the Royal Commission.

Dr. SQUIRE said there were one or two points which he should like to allude to, the first being his experience with sulphuric anhydride, which showed how investigators might go utterly astray for a long time. In his original patent for the manufacture of sulphuric anhydride by catalytic he simply utilised a process of Deville's for making oxygen. In that process concentrated sulphuric acid was poured upon very hot platinum foil, which resolved it into sulphurous acid, oxygen and steam; the sulphurous acid was removed by milk of lime or a solution of an alkali, while the oxygen went on its way. When sulphuric anhydride was the product sought, the sulphurous acid was, of course, not removed, but both gases were very thoroughly dried. The other half of the process was really known before, namely that sulphurous acid and oxygen could be combined by means of spongy platinum. It was platinum black at the commencement, but it very soon became spongy platinum. Winckler suggested precisely the same process which he (Dr. Squire) had already patented, only Winckler published his process a few months later. Dr. Messel and himself worked on this process for a long time, and generally on the wrong lines, as was so often the case first. It was thought that neutral or indifferent gases interfered very much with the reaction. Both Winckler and Scheurer-Kestner said so, but as a matter of fact this was not the case. The temperature was kept up to about 450° C. by means of a fire under the vessel containing the spongy platinum. Some hundreds of tons of sulphuric anhydride had been made at that temperature, but it was afterwards discovered that this temperature was far too high and really the heat ought to have been got rid of instead of maintained. The decomposition of sulphuric acid turned out to present

a great many difficulties, and was far too expensive. Practically no apparatus lasted for any time. Iron retorts were rapidly destroyed and clay retorts leaked. The fact was the conditions were not at all the same as they were in gas works. In gas works the retorts became lined with graphite, which kept them tight, and if no graphite was produced these clay retorts leaked very badly, and in this case of course no graphite was produced. The next step was to produce a cheap sulphurous acid and mix it with the requisite quantity of air. This process he carried out in the first place at Scheurer-Kestner's works in Alsace. It was accomplished by compressing to four atmospheres the gases from burnt sulphur and treating the gases with water, while in a state of compression. Nitrogen passed away and a strong aqueous solution of sulphurous acid was obtained. This solution was afterwards boiled to evolve the sulphurous acid. The compression of these gases on a large scale presented many difficulties, for it was found that nothing but indiarubber and lead, neither of which had any mechanical strength, should come in contact with the gases, but the mechanical difficulty once overcome, this modified process worked very well. But it was ultimately abandoned, for it was found that the presence of indifferent gases did not as a matter of fact interfere with the process when a much lower temperature was used for the catalysis, and eventually the process became a workable one when applied directly to the gases evolved by burning pyrites without any compression at all. Mr. Moulton, in alluding to cold storage, said that yeast was among the substances which could be kept for a long time at a low temperature, but cold storage, although it suspended the activity of the bacteria which brought about the decomposition of the yeast, was not a complete success. The best temperature for keeping yeast was about 4° C., it must not go below zero, for freezing completely spoils it. But if the low temperature were kept perfectly uniform, it did not seem to prevent the growth of the moulds, which grew on the yeast bags almost as well at a low as at a high temperature, and that gave the yeast an unpleasant smell and taste.

Dr. F. B. POWER said it would be needless to attempt to emphasise the great interest which this paper possessed. He experienced the difficulty of many preceding speakers, that of not being able to deal in an impromptu manner with a paper covering so wide a range and including so much in its scope. Those who had worked in the domain of pharmacological chemistry would recognise the significance and interest attached to the facts brought forward. He was sure this address would stimulate all chemical workers, and afford many ideas which would be useful to them in their investigations.

Mr. LEON GASTER said he would like to mention one or two instances in which waste still occurred. One was in the case of blast-furnace gases, which were not as yet sufficiently utilised. They were made use of in Dr. Ludwig Mond's and other ingenious processes for making producer gas for gas engines, but it remained as yet to be proved that the efficiency of the large gas engines came up to expectations, and that they could keep their place against large units of reciprocating steam engines or of steam turbines. The latter had gained favour with central station engineers for greatly contributing to reduce the price of power generation in connection with electric central power stations, whence the current was distributed at a distance for lighting and motive power for industrial purposes. On this occasion he wished to emphasise another waste, and to help to dispel the erroneous idea, which prevailed too much in this country, that the existing water power could not be turned into account. In view of the great improvements made in the modern construction of turbines, governors, and hydraulic plant generally, it might safely be expected that in the future those powers now wasted would be utilised to the advantage of many industries. It must be borne in mind that if, owing to the great fluctuations of the head of water and the amount of available water power, the erection of a reserve steam or gas-power plant were required, so long as the item representing the fuel, which must continually be consumed, was greater than the interest on capital for erecting the water-power plant, there would be more than one reason for utilising the water power, and saving the fuel.

Mr. OSCAR GUTTMAN said, if the purport of the paper were summarised, it was that the trend of invention lay in two directions, namely, cheapness, or increase in economy, and increase of yield; but it appeared to him that the author omitted a third direction, which he believed to be the ultimate factor in production, namely, quality. If the cost of production were continually being reduced, a certain limit would be reached when the general expenses amounted to more than the cost of labour, and it was then almost impossible to make any further reduction. If an increase of yield were aimed at, there was also a limit beyond which it was not possible to go. When these two limits were reached there was only one thing left, and that was quality. In many inventions that had come under his notice, the aim was for quality more than for anything else, because the other means had been exhausted. If a manufacturer could get a yield of 98½ per cent. of something at a cost which had beaten every competitor for some time, but was now on a level with everybody else, he turned his attention to producing a product which was free from all possible impurity, and could thereby secure a more ready sale; he might not always patent that method, he might keep it to himself, but he would produce an article which obtained a well-deserved reputation for him, and would secure his market. It appeared to him that the British chemical industry had been kept from decay through having always been able to produce articles of good quality, and insisting on this standard being maintained.

The CHAIRMAN asked Mr. Moulton whether any recent progress had been made in the economical conveyance of electricity generated at a distant spot where there was adequate water power. He had seen so much of water-power schemes, where the power was undoubtedly cheap, but where it cost so much to take the raw material there, and so much to bring the manufactured material away, that the cheapness of the water power was useless. He understood that progress had been recently made in connection with this subject, and he thought it would be of much interest if Mr. Moulton would enlighten them upon it. One other point struck him that Mr. Moulton might possibly have included in the scope of his remarks. He had laid such stress upon the fact that laboratory research led to industrial developments in chemistry, that one would like to know his views as to the industrial possibilities of present research in connection with stereo-chemistry. He, of course, recognised that at the present moment it was not industrial, but the suggestion was that there might be a possibility of its becoming so, and that it would be well that this possibility should be put before those interested in industries in which it might become a competitor, just as it would have been of enormous advantage to them if the indigo planters of India had taken sufficient notice of Sir Henry Roscoe's discourse years ago at the Royal Institution on the synthesis of indigo from ortho-phenylpropionic acid.

Mr. MOULTON, in reply, said he had been greatly interested in many of the speeches, and had felt the same difficulty that they had felt with regard to the paper. It was difficult to take hold of the speeches at the moment so as to keep them vividly before one's mind. Mr. Reid had tried to correct him on the subject of the combined nitrogen of the world, which he had attributed to the humble but patient work of bacteria, suggesting that it might be due to lightning. He could assure Mr. Reid he had thought of primeval thunderstorms also as a possible source, but his sense of humour had prevented him trying to drive a team of bacteria and thunderstorms together. Later on Mr. Guttman took him to task for not having emphasised the importance of quality. He certainly thought of that, but he viewed it rather as a corollary from what he had said than as naturally forming part of the paper itself. The whole of that part of the address consisted in emphasising the necessity for absolute control even of the small forces that influenced local combination, and the conclusion he drew in his mind was that if they were to enter upon a part of progress of that type the first thing they must insist upon was perfect purity of the reagents. If you were to have uncertainty in your reagents, if you did not know whether they were going to be pure, how in the world could you get certainty in local action. He was

delighted to find that so great an authority gave a high place to English productions from that point of view. Might they ever keep it, and then they would have a sure foundation for future progress. The Chairman had attempted to draw him on the subject of conveying electricity to a distance. He was delighted to think the world was getting so wise as to see that it was better to take electricity to their centres of population rather than make centres of population where there was electricity. Raw material and workmen required roads and railways, but a high tension current was well content with three wires, and it was an economic absurdity to attempt to convey cumbersome products, including workmen, that required careful handling, to almost inaccessible places instead of bringing the electricity to the town. Certainly on the other side of the Atlantic they had no doubt about it. They carried electricity of a high potential from 120 to 150 miles, and he thought the time was very near when the great sources of electricity would all be made to supply motive power to centres of industry which were determined by totally different considerations. Then the Chairman had touched on stereo-chemistry and all the wonderful work done with regard to the sugars, which was a marvellous specimen of brilliant chemical research. He had been preaching throughout the paper on the great gulf that existed between theoretical chemistry and industrial. Theoretical chemistry sought the truth, industrial sought the result. Now the Chairman wanted him to treat stereo-chemistry as being part of industrial chemistry. With all due respect to his auditors he must tell them it was their fault that it was not but they must not take him to task because the members had not yet succeeded in making this industrial. Recent researches could not be read, he might say, in any branch of chemistry without seeing the vast possibilities of industrial processes. But to-night they were not dealing with the possible, but with the progress which made them actual. Therefore the synthesis of the sugars was not yet ready for him. Nothing was more charming than that department of chemistry, and nothing that he so much longed to see made industrial, and he trusted there were many present who would distinguish themselves by the conquest over industrial chemistry of that great triumph of theoretical chemistry.

Nottingham Section.

Meeting held on Wednesday, October 25th, 1904.

MR. J. T. WOOD IN THE CHAIR.

NOTE ON COLLIN.

BY J. T. WOOD AND S. R. TROTMAN.

The paper on "A New Method for the Analysis of Tannin and Tanning Materials, and the Identification of Admixtures in Tanning Extracts and Liquors," by Dr. J. Gordon Parker and E. E. Munro Payne, read before this Society on June 6th, 1904, is a very valuable contribution to the history of tannin analysis (see this J., 1904, 648-651). The authors treat the tannin solution with lime water, allow to stand for four hours, filter off the precipitate and titrate the lime remaining in the filtrate, using phenolphthalein as indicator. The figure obtained represents what they call the *total absorption*. They then remove the tannin by means of a neutral solution of "collin" (for preparation see J., 1904, 649). The lime absorption of the detannified solution is now taken. This they call the *acid absorption*, the difference between the two figures being the true tannin.

In the present note we do not wish to criticise the process proposed, but to examine the author's statement that collin is a pure form of collagen (*loc. cit.*, p. 649), but deprived almost entirely of its calcium base. This statement appears to us of importance, inasmuch as, if it can be shown to be correct, it will have an important bearing on the constitution

of gelatin. We do not propose to examine the question whether lime forms an essential part of the gelatin molecule (we have not previously heard this maintained), but to show that collin consists of a mixture of hydrolysed gelatin and gelatones in varying proportions depending on the temperature and length of time the solution is heated, and further to show that this variation in the constitution of the solution has an influence on the precipitation of tannin.

To simplify matters it may be well to state that we adopt Allen's definition for gelatin (Comm. Org. Anal., IV., p. 461), viz.:—a proteoid resulting from the hydrolysis of collagen or ossein by boiling with water or dilute acids. The properties of gelatin are given by Allen (*loc. cit.*)

We prepared a 5 per cent. solution of Coignet's Gold Label gelatin, and estimated the nitrogen in 50 c.c. by Kjeldahl's method; 0.348 grm. nitrogen was found, which multiplied by the usual factor 5.42 gives 74 per cent. of gelatin. We then saturated the solution with zinc sulphate which precipitates the whole of the gelatin, and again estimated the nitrogen in the precipitate: 50 cc. of the 5 per cent. solution gave 0.333 grm. nitrogen or 72.22 per cent. of gelatin. The difference between the two results indicated the amount of nitrogenous matter *not* gelatin in the sample.

From the above gelatin a solution of "collin" was prepared exactly as prescribed by Parker and Payne, containing 5 per cent. pure gelatin calculated from the above experiment. The solution was saturated with zinc sulphate to precipitate unchanged gelatin. The resulting precipitate contained only 0.1625 grm. of nitrogen in 50 c.c., indicating 35 per cent. of the original gelatin. The clear filtrate from the zinc sulphate was treated with bromine to precipitate the peptones, shown to be present in the filtrate by the biuret reaction, and nitrogen in the precipitate determined by Kjeldahl's method. The nitrogen found was 0.203 grm. or a total of 0.4655 grm. nitrogen, which corresponds very well with the total nitrogen previously found. We then examined, in the same way, a collin solution which had been heated on the water-bath for 40 minutes instead of 20 minutes as prescribed, the nitrogen precipitated by zinc sulphate amounted to 0.068 grm. in 50 c.c. whilst the bromine precipitate gave 0.371 grm. nitrogen. There was a further 0.020 grm. nitrogen in the filtrate from the bromine precipitate, indicating the presence of 3 per cent. lower compounds of nitrogen.

The results are shown in the following table:—

Nitrogen in 50 c.c. original solution of gelatin—
0.469 grm.

	A.	B.
	Grm.	Grm.
Nitrogen precipitated by zinc sulphate (gelatin and gelatones).	0.1625	0.068
Nitrogen as peptones (bromine precipitate).	0.3030	0.3710
Nitrogen as lower compounds.....	Nil	0.0200

A.—Collin prepared as prescribed by Parker and Payne.
B.—Do. do. heated for 20 minutes longer.

The appearance of lower nitrogen products indicates that the solution is undergoing decomposition, and as these products do not precipitate tannin, it appears to us that a serious source of error may here be introduced into the process. The composition of a gelatin solution heated with caustic soda is so sensitive to change of temperature or time of heating that we have found it practically impossible to prepare solutions of the same composition.

A still more important fact, in view of the purpose for which the collin is to be applied, is that the combining proportions of the unchanged gelatin with gallotannic acid differ considerably from the combining proportions of peptones with gallotannic acid. We hope to give some figures relating to this in a future note. The conditions sought for in a body used to separate tannin from other matters seem to be:—(1) The body should precipitate tannin only and combine with it in definite proportions. Collin appears to precipitate gallotannic acid only, but not

in constant proportions. (2) It should be easily procured in a state of purity. It appears to us that these conditions might be fulfilled by selecting a proteid of simple and known constitution, such as the protamines described by Kossel (Rev. Gen. d. Sciences, 1889, p. 380), and which form the nucleus of the proteid molecule.

In conclusion, if collin were a pure collagen or gelatin, it should give constant reactions with different reagents and be of constant composition. We have shown that it does neither of these things. Collin cannot therefore be purified gelatin or collagen.

DISCUSSION.

Dr. PARKER said he was afraid the authors had taken the paper published by Mr. Payne and himself a little too literally. They claimed that collin acted in the same manner as a pure form of collagen. Collin was first of all made in 1898 by Mr. Payne, who was then working up pharmaceutical preparations, and he used it for dissolving morphia for the purposes of injecting into blood. He (Dr. Parker) had tested various solutions of collin, and only in one sample was he enabled to get a precipitate of gelatin by means of zinc sulphate, when they had prepared in the manner prescribed by heating for 20 minutes at 90° C., using the correct amount of soda. He and Mr. Payne were pleased that their paper had raised such an amount of criticism, and hoped that much good might arise from it. Accepting the authors' statement, he found from his figures that 35 per cent. of his solution was unaltered gelatin. Even then that would not have altered the process in regard to the estimation of tannin, because in the process Mr. Payne and himself devised in the estimation of tannic acid they used such an excess of collin that even if 35 per cent. of gelatin were present there would still be sufficient collin to precipitate the tannic acid. The taking of a skin and not a bone gelatin was one of the essential features of the process. He further thought that the results obtained by the author were in some measure due to the use of Coignet's gelatin, which was a bone product, and hence contained a considerable quantity of chondrin.

Mr. TROTMAN considered that more exact directions for the preparation were required. If as Dr. Parker said the nature of the original gelatin influenced the result, then he should have specified a particular form to be used. Secondly, if, as the authors had shown, the preparation of collin solution by the method given did not ensure the hydrolysis of all the gelatin, the importance of the method of analysis was largely discounted, owing to the fact that the collin solution would no longer differentiate between gallic and tannic acid.

Prof. KIPPING said he disagreed with Dr. Parker in regarding collin as a definite substance. What he (Dr. Parker) called collin was doubtless a mixture of a great number of substances which were derived from the breaking down of the gelatin. As the object of the analysis was to obtain a substance which would precipitate tannic but not gallic acid, would it be possible to merely take a pure gelatin and boil it until there resulted a solution which gave no precipitate with the latter acid; such a solution might serve as a standard "collin."

The CHAIRMAN said, from the experiments which had been carried out, he was of opinion that the action was not quantitative, because the gelatones appeared to precipitate varying quantities of tannin. He considered it was impossible to make a solution of constant composition by following out the directions given. With regard to their not having used the right gelatin, Parker and Payne specify "a good commercial gelatin," they (the authors) used the best they could obtain.

Dr. PARKER said it was his custom to test the solution of collin, and if it precipitated gallic acid he rejected it, and made a fresh solution.

THE DIFFERENTIATION OF THE DIFFERENT FORMS OF NITROGEN IN GLUE.

BY S. E. TROTMAN AND J. E. HACKFORD.

Chemists who have had experience in the analysis of glue are well aware of the difficulties attending the operation and

connected with the interpretation of the results of the analysis. In our experience there is no class of bodies so difficult to report upon in a satisfactory way, nor in which the ordinary chemical constituents have hitherto given so little ground for forming an opinion. In the following paper we hope to indicate a method of analysis which will to a certain extent remove these difficulties. That much time and trouble has been devoted to the subject is evident from the following brief summary of the methods used by various chemists for the determination of the gelatinous constituents of glue, on the one hand, and its physical characteristics on the other.

It is of course admitted by all that an analysis must include determination of water and ash. So far as these go there is little room for divergence, and we propose to confine ourselves to the nitrogenous constituents only. The following methods are the most important of those proposed for their determination:—

(1) Determination of total nitrogen by Kjeldahl's method and calculation to gelatin.

(2) Determination of total nitrogen by soda lime (Noffat, *Wagners Jahresb.*, 1867, 672).

(3) Precipitation by tannin and either measuring nitrogen in the precipitate or titrating excess of tannin in filtrate (*A. Muller, Zeits. angew. Chem.*, 1902, 15, 482).

(4) Precipitation by chlorine and determination of nitrogen in the precipitate.

To all these methods one fatal objection may be urged, *viz.*: that in every case peptones and other non-gelatinous nitrogenous bodies are thrown down or coestimated while the composition of the tannates of gelatin are too uncertain to make the method (3) reliable.

(5) Determination of non-gelatinous constituents by precipitation with alcohol, filtering, and weighing. This is difficult and somewhat uncertain.

(6) Precipitation of gelatin by tannin and determination of unprecipitated matters in filtrates to which of course the objection mentioned above applies.

The physical tests for glues are numerous and are affected by so many conditions as to make them unreliable or at any rate incomparable. Some largely exaggerate differences, while others do not draw any sufficiently distinct line between good and bad samples:—

(1) Water absorption figure (*Shattermann, Dingler's Polyt. J.*, 1845, 96, 115).

(2) Consistency and bearing weight of jelly (*Lipowitz, Neue Chem.-techn. Untere.*, Berlin, 1861, 37—42).

(3) Determination of melting point (*Kissling, this J.*, 1901, 510).

(4) Determination of viscosity (*Engler, this J.*, 1890, 654).

After a long experience of these tests we have discarded all except a consistency test communicated to Mr. Trotman by Mr. H. S. Garry, which we find to give reliable comparative results, and which agrees well with those obtained by the method of estimation of nitrogenous constituents which we now employ.

In this method the glues are compared with a standard glue or gelatin, of which it is necessary to keep a stock.

A 10 per cent. solution of the standard, and various strength solutions of the glue under examination are made, and allowed to stand overnight. The consistency is tested in the morning by pressing the jelly with the finger tips, in order to ascertain which strength solution of the glue corresponds to that of the standard.

In the subjoined table it will be seen that the consistency of some of the examples is 150, 120, &c., which indicates that these samples are respectively 50 and 20 per cent. better than the particular glue which we take as our standard.

Although the above method may appear crude, the results obtained are very consistent, and, in our opinion, the error never exceeds 10 per cent. As a rough test for manufacturers, naturally a simple physical test has its advantages, although those which are usually applied are only intelligible to the person who makes them, and while giving comparative figures, are of no absolute value. Moreover, the physical test is no real check on manufacture, as a chemical analysis should be.

	Consistency by Experiment.	Consistency by Calculation.	Total N $\times 5.33$ by Kjeldahl = Gelatin.	N precipitated by $ZnSO_4 \times 5.33$ = Albumoses.	Peptones by Difference.
No. 1, best gelatin.	150	150	74.03	72.23	1.81
No. 2 = No. 1 boiled two hours.	..	143	74.03	71.36	2.67
No. 3	135	131	71.64	69.54	2.10
No. 4	120	124	73.62	68.05	5.57
No. 5	110	112.5	74.30	67.0	7.3
No. 6	90	87	71.04	64.18	7.86
No. 7, a bad over-boiled glue.	40	37	73.02	57.99	15.03

The weak point of all the above methods of analysis is, that they totally fail to differentiate between gelatin proper and hydrolysed gelatin and peptones, or lower nitrogenous bodies which may be produced by a faulty method of manufacture. Since these peptones, &c. not only have no glue-like properties themselves but actually prevent glue from properly setting, it is obvious that their determination should be an important factor in the analytical opinion of a glue, and that if this operation be also accompanied by a determination of the gelatin proper, we have in our hands at the same time both the positive and negative sides of the problem to be solved. If, further, a total nitrogen determination be made, we have also a measure of what the glue might or should have been, and the nearer the gelatin figure approaches to the total nitrogen the better the glue.

Briefly, the method we have used is:—

(1) The determination of nitrogen by Kjeldahl's method.

(2) The determination of albumoses by determining the nitrogen in the precipitate thrown down by zinc sulphate (Factor = 5.33).

(3) The estimation of lower nitrogenous bodies either by (a) precipitation by bromine, or (b) by taking the difference between the figure for albumoses and that for total gelatin as estimated above.

Method.—One gm. of finely powdered glue, or its approximate equivalent of size, is dissolved in a quantity of water not exceeding 20 c.c. While still hot, zinc sulphate crystals are added in excess to saturate the solution. It is then well stirred by a rod or mechanical stirrer, filtered through a funnel containing a plug of glass wool forced into the stem, and washed with saturated zinc sulphate solution. The glass wool and precipitate are subjected to analysis by Kjeldahl's method, the nitrogen found multiplied by 5.33, giving the albumoses present.

Alternative Method.—The solution is made of the same strength as before. Zinc sulphate crystals are used in considerable excess, so that the solution becomes semi-solid. It is then stirred with a rod—keeping the solution hot—whereupon the albumoses cling to the rod and to the sides of the vessel, leaving the solution practically clear. Should the precipitated albumose be seen to still float after stirring, the addition of more zinc sulphate will cause it to coagulate and stick to the rod. The remaining liquid is decanted off, the precipitate washed with saturated zinc sulphate solution. The precipitate is dissolved in about 10 c.c. of concentrated sulphuric acid, and the nitrogen determined by Kjeldahl's method. The latter method of estimation is identical with that in which the albumoses are filtered, and is much quicker in operation. The filtrate from the albumoses may be rejected, but if the determination of peptones and of bodies lower than peptones should be required (*e.g.*, creatinine, creatine, asparagine, &c.), the peptones may be estimated in it by Allen's method, and the lower nitrogenous bodies by the estimation of nitrogen in the filtrate from the bromine precipitate. These lower nitrogenous bodies only occur in cases in which the glue has undergone considerable decomposition by hydrolysis, caused by excessive boiling, or by the glue having an excessive acid or alkaline reaction when boiled. The value of a glue depends upon the percentage of albumoses present, and moreover, anything which tends to deduct from the percentage present deteriorates the quality of the glue. In a

perfect glue the amounts of albumoses and of gelatin present, as determined by Kjeldahl's method should be identical. Other nitrogenous bodies should be absent, since they have no adhesive properties; whether the amount of these lower nitrogenous bodies acts only as dilutents, or whether they are actively deleterious, is not yet quite clear, and we are still experimenting in this direction. It is by no means necessary to estimate the peptones by Allen's bromine method, and then the simpler bodies, since the "peptone" figure obtained by difference is equal to the sum of the above two figures, and this difference figure is a measure of the loss of gelatin by the manufacturer, and thus the care that has been used in manufacture can be criticised.

In the case of No. 2, a pure gelatin (No. 1) was boiled for two or three hours under a reflux condenser. It will be seen from the tables that while the total figure for the Kjeldahl has not diminished, yet the albumoses have done so, illustrating its deterioration in quality. Also in the case of No. 7, an over-boiled glue, while the total nitrogen figure is 73.02 per cent., showing the quality the material might have attained, yet the figure for albumoses is only 57.99, showing that only this percentage of the glue by weight, and not 73.02, is available for adhesive purposes. It will also be seen in this sample that a considerable quantity of the peptones have been converted into simpler nitrogenous bodies, thus indicating that the glue has been considerably over-boiled.

Since the consistency test is made a means of testing the quality of the glue it follows that there should be some analogy between the qualities as given by the albumen figure and that given by the consistency. That such is the case is shown by the figures given in the table, and which are comparable with a set of figures in which the consistency has been estimated from the albumoses by taking a mean difference of 1.4 per cent. in the albumoses to correspond with a difference of 10 in the consistency figure.

DISCUSSION.

Prof. KIPPING said that there seemed to be a certain analogy between the changes which glue and gelatin underwent on boiling with water and those brought about in the treatment of an equally complex substance—starch, with acids or with diastase. In both cases the hydrolysis probably results in the production of a great number of products and not merely one or two. The authors had distinguished the two sources of nitrogen, namely, albumoses and peptones, but there was little doubt that under the head of albumoses they were dealing with a great number of compounds, likewise with the peptones. The suggestion for the analysis of glue was obviously a very good one, and the only other point which he might raise was whether the authors of the paper had thought of using the polarimeter, which was so useful in observing the progress of decomposition in the case of starch. So far as protoses were concerned, the Chairman had remarked that no pure specimens had been obtained, but the recent researches of Fischer, in Germany, had already advanced to such a stage that a complex compound related to the protosis could be obtained in a state of purity.

Mr. H. S. GARRY said that, on account of the difference of consistency as shown by the statistics, it was evident that a first-class quality of gelatin had been employed. It was possible from the consistencies given to tell exactly where the glues came from, and that in the lowest consistency glue there was a conglomeration of sinews and blood boiled up together. The total amount of nitrogen was due to the source from which the matter was derived.

Dr. PARKER said there was no doubt that in the various gelatin factories there was an enormous amount of ignorance as to the nature of gelatin, because it was not definitely known how many gelatins there were. A good many of the tests which chemists employed were worth nothing, but if the method which the authors of the paper suggested would precipitate all the albumoses it would prove to be a very valuable thing.

Mr. WATSON said the quality of the resultant gelatin depended upon the percentage of nitrogen of the bodies employed in manufacture.

Mr. TROTMAN said they did try the polarimeter but the deflexions were not great enough to give satisfactory results. He disagreed with Mr. Garry that the analysis necessarily portrayed the origin of the materials used in the manufacture. It seemed to him a curious thing that they always got about 74 per cent. of gelatin by the Kjeldahl method, which went to show that the total amount of nitrogen did not depend upon the origin of the nitrogenous materials used. Whatever they made gelatin from, if they made it properly they could get a good glue. They could make a good bone gelatin and they could make a good skin gelatin. The value of their process was that it showed the manufacturer what amount of gelatin he had got and what amount he ought to get. That was a distinctive advantage.

They did not claim any originality in regard to this, but thought that the examination of glue upon the lines they had suggested was an advance in many of the methods now in use and could give the manufacturer valuable information.

NEW METHOD FOR THE ANALYSIS OF TANNIN AND TANNING MATERIALS, &c.

BY DR. J. GORDON PARKER AND E. K. MUNRO PAYNE.

(This J., June 30th, 1904, 648—651.)

DISCUSSION ON THE TOTAL LIME ABSORPTION FIGURE.

Mr. S. R. TROTMAN said that in experimenting with this process he had found that in a few cases the total lime absorption, if taken immediately after shaking, was distinctly greater than at any subsequent period. The difference was sufficiently great to alter the final results to the extent of 5 per cent. As the point seemed somewhat interesting and might require further investigation by those interested in the process he took advantage of Dr. Gordon Parker's presence to call his attention to it.

Dr. J. GORDON PARKER said, in reply, that under certain conditions, especially noted in sumacs, the lime solution formed at first a precipitate by basic gallate with gallic acid, which subsequently dissolved, thus accounting for the final reading being lower than the first. This point was somewhat intimately connected with another he had noted in connection with sumacs, viz., that in some cases practically the whole of the total lime absorption was due to gallotannic acid, while in others it was largely due to gallic acid, only two or three percent. being gallotannic. This was an important point for tanners, since the gallic acid did not produce true leather. If used merely for bleaching effects, these sumacs, containing much gallic acid, might answer very well, but would undoubtedly produce poor leather.

Yorkshire Section.

Meeting held at Queen's Hotel, Leeds, on Monday, October 31st, 1904.

CHAIRMAN'S ADDRESS.

THE UNIVERSITY AND TECHNOLOGY.

BY H. H. PROCTER.

The present year is memorable in the history of science in Yorkshire as having witnessed the birth of its first university. Independence has been forced upon it without its desire, but the necessity having arisen, difficulties have been met with the accustomed energy of the Yorkshireman, and by private and public liberality, funds are being found to make the university one worthy of the county. It is therefore an appropriate time to consider in what way these funds can best be administered to promote the well-being of those, both richer and poorer, who have made considerable sacrifices to provide them; and what objects should form the particular aim of a Yorkshire university.

While we cannot hope to compete socially with Oxford and Cambridge, we may reasonably look forward to the time when our university will become a centre of thought and culture for many to whom the older universities are inaccessible, and we hope that it may do much to spread that interest in arts and literature without which no high civilisation is possible, and which is the access to so many of the pleasures of educated life. Much weight must also be laid on the important work which has hitherto been done by the Yorkshire College, and which will be continued and extended by the university, in training teachers for our schools; and it is difficult to estimate the gain to our young people of all classes from being brought under the influence of properly educated teachers, whose mental horizon is not limited to the primary school and the "pupil-teachers' centre."

These services, however, important as they are, are not those which appeal most directly to us as a scientific and technical association; and what I wish more especially to consider, is the direct influence which the university may exert on technology and on trade, and the lines on which, in these respects, it can render the greatest help to the community.

We shall hardly dispute the necessity of a sound foundation of general science for all technology, nor question the wisdom of building up the most perfect teaching departments which we can achieve in order to give it; but what may not be quite so obvious is the need that these departments should not merely teach the elements of their respective sciences, but should be capable of carrying their instruction up to the highest and most recent developments of knowledge. I do not say that the old-fashioned common-places of elementary chemistry are played out, for we all know of industries in which the law of combining proportions would be high science, and of mistakes which the merest schoolboy knowledge should have prevented; but new industries arise out of new knowledge, and it is impossible to say how soon the most abstruse investigation may become the source of important practical progress. How many chemists of the older school are able to discuss the wandering of the ions and their electric potentials, which are subjects of earnest thought to those engaged in the chemistry of such processes as electrolytic soda and bleach manufacture, or the electrolytic separation of metals; yet we have seen how soon such processes may completely revolutionise an old-established chemical industry. How many of us have studied, as they ought to be studied, the phenomena of catalysis as they affect the sulphuric acid "contact" process, or have fully mastered the intricacies of the "phase-rule" which is shown to have governed the natural separation of the various salts in a salt deposit, and which equally may be applied to the separation by crystallisation of salt-solutions in a chemical works? It is needless to multiply instances; but we want to place in the hands of our young men those weapons which were unknown in our student days, and which we handle, if at all, with something of the stiffness of middle age. Such teaching needs the resources of a university, and can only be effectively given by the co-operation of the ablest men in the various related sciences working in well-provided laboratories. It is not merely the professors who take their part in such a training, but of perhaps equal value is the influence of one student upon another, and only those who, like myself, have acquired most of their knowledge by laborious private study, often in loneliness and unsympathetic surroundings, can fully appreciate how our way would have been smoothed, and how much higher it might have led, if we had had the advantages which a university would have put at our disposal.

In England we have not yet succeeded in enlisting sufficiently the highest scientific ability in the cause of industry. Our greatest masters of pure science rank with those of any country; but though we can point to many brilliant exceptions, I do not think that the average of our technical chemists can compare in training, or perhaps even in ability, with their German competitors. As an army depends for success on its officers, so also does an industry; and if our chemists are inferior, we are bound to be driven ultimately from the field, though for a time we may hold the positions which we have won. If my

assertion is admitted, and I do not think it will be disputed by anyone to whom both countries are familiar, it is of the utmost importance that we should search for the cause, for I cannot for a moment admit that it lies in any natural inferiority of the English race. Rather, I should be inclined to say, and I have had rather unusual opportunities of observing students of many nationalities, that the Englishman would be well capable of holding his own, if he started with anything like an equal training. Unfortunately this is not usually the case. It is exceptional to find the student fresh from school possessed of a good working knowledge of arithmetic and elementary algebra outside the regular school examples; and this is even more the case with youths from public and upper middle-class schools, than with those from the excellent higher grade and modern schools of our cities. A reading knowledge of modern languages is generally conspicuous by its absence, while the foreign student can avail himself of the literature of at least one or two other languages beside his own. This is certainly due to no incapacity in the Englishman, but rather to the conviction on the part of the schoolmaster that a language is mostly important as an exercise in philology and grammar. A mere reading knowledge of any one of the latin or teutonic languages can be attained by most people in a few months of well-directed work, and forms an excellent basis for the more complete study which is needed to write and speak it correctly.

A still more serious difficulty, however, than the want of preliminary training is the lack of inducement to first-rate men to adopt technical chemistry as a profession. It is not to be expected that an able man will encounter the expense and loss of time involved in a four or five years' training such as is common with German chemists, unless he can feel some reasonable certainty of a comfortable livelihood as its ultimate result. If he is possessed of energy and business capacity he will probably find more remunerative ways of spending his time, while the scientific enthusiast finds quite as hopeful a pecuniary result in pure chemistry, and recoils from the narrow routine into which many technical chemists are forced. This condition of things is largely due to the scientific ignorance of manufacturers and business men, to many of whom (I fear I might say to most), a chemist is merely a man who can wash bottles and make an analysis. Now there are plenty of men who can do this, at least when the analysis is not out of their routine, who can be got for from 30s. to 50s. a week, and are very possibly not worth more. A prospect of this sort will not pay for five years' education after school years, or be much inducement to the man who can afford it; and the manufacturer will not see why he should pay more than appears to him to be the market price of the article he wants. Clever as he may be in judging his wares, he does not see that he is getting a chemical labourer instead of a chemist. The labourer has his uses, and is abundant in German laboratories, but he is not there called a chemist, but a "laborant." The only way out of this difficulty seems to me to lie in the better education of the manufacturer. It is in most cases useless for him to suppose, even if he has had an adequate chemical training, that burdened as he is with the business control of a large affair, he can himself devote the time and continuous study necessary to keep his manufacture abreast of the latest scientific thought, and introduce all possible improvements, though, in many cases, if he had adequate aid to develop his practical suggestions, he might do much. But even a far less knowledge than this would enable him to realise the directions in which a first-rate chemist might assist him, and to judge the capabilities of the men at his disposal. Having found the man that he needs, it is a short-sighted policy, commoner I fear in England than in America, to continue to pay him less than his real value. The profits that might be made in many industries by a first-rate chemist under first-rate business management are so large that liberal payment can well be afforded, and if this were given, the fear that your chemist, having learned your technical secrets, might carry them to some better market, would be much less likely to be justified. In this direction, of course, personal reliability is as important as scientific attainments.

Another mistake, which is not confined to English manufacturers, is, having got your ideal chemist, with the

rare power of originating and carrying out new ideas, not to give him adequate assistance, but to keep him at routine work, which could be done equally well by the chemical labourer. No man can do more than a limited amount of work, or develop new ideas without time for thought, and I have in my mind a case, not this time in England, where a firm is losing hundreds if not thousands in this way, to save a few pounds a week.

So far I have spoken mainly of purely scientific training, but there are few manufactures in which a chemist trained only in the chemical laboratory can make himself of much use till he has gained experience in the works, and this is true in industries of a purely chemical character, though not to the same extent as in those like my own special branch, in which chemical and mechanical operations are of equal importance. It is not possible that any university or college training can entirely do away with this necessity, but if the gap cannot be entirely avoided, it is worthy of consideration how far it can be bridged or narrowed. This is one of the aims of technological as distinguished from purely scientific teaching. Another aim is to present to the student in a scientific and systematic way the special chemical problems of an industry, and to make clear the underlying reasons for operations, which at the works are often carried on in a purely empirical way, and with little clear understanding of the relation between cause and effect. In order to do this with effect, certain knowledge of the practical methods of the trade is obviously needful. In order to carry out experiments, machines and special apparatus are often necessary, and in the partially mechanical trades a degree of manual skill is required to imitate sufficiently for experimental purposes the processes of the factory. All this must obviously be provided if the university is to undertake technical teaching of more than a purely theoretical kind; and this being so, the question naturally arises as to how far this practical side of the work is to be carried; and the answer will to a considerable extent depend on the circumstances of the trade. The idea which has found favour with the authorities of technical schools has usually been to imitate as far as possible the conditions of the factory in order to give what is called "practical experience." I do not say that this is in every case a mistaken course, but I think very special circumstances are required to render it a wise one, and that these very circumstances usually place it outside the scope of university work. The ordinary evening school technology may in most cases be dismissed as almost a pure waste of public money as regards improvement of trade—a sowing of seeds in untilled and often infertile soil. To improve an industry something more than evening class knowledge is required, and however admirable a little knowledge may be, the working man is rarely in a position to put it in practice. Of course in this estimate I do not include such work as that of the Bradford Technical College, or our own evening classes, which appeal to the class of foremen and workmen, managers, who both need and can use the special information given them. There are also cases in which the actual teaching of a trade in evening schools seems to be justified by public needs. A good instance of this is shoe manufacture. In old times the village shoemaker bought his leather of the village tanner and the village currier, and did the work with his own hands from start to finish. Now a man may spend his entire working life in cutting soles with an eccentric press, or lasting uppers with a lasting machine. However intelligent such a man may be, the factory affords him no scope to learn his trade as a whole, and when a foreman or a works manager is required, it is impossible to find one who has a practical knowledge of the whole manufacture. In this case the trade school comes in to complete the training of the clever workman, and to enable him to realise the relation of his own part of the work to the whole.

A somewhat similar need may be felt in the higher walks of technical education in trades like leather manufacture, where the apprenticeship system has almost completely broken down, and the only way for a young man of moderate means to gain access to leather works is to make himself of sufficient immediate practical value to obtain a post. Apart, however, from these exceptional cases, it is my deliberate opinion that it is no part of the work of a university to

teach the manual dexterities of a trade beyond the point which is necessary for successful study and experiment. In fact I think the English manufacturer is apt to waste too much of his son's time on such attainments. For an employer or even a manager it is necessary to know how every part of the work should be rightly done, but he can hardly hope to rival his workmen in manual skill, while it is questionable wisdom to court the possibility of failure. He must know much of which his workmen are ignorant, but need not compete with them in their own department. It is impossible, too, for the University really to give the experience of a factory without transforming itself into one, and as soon as work is on a sufficient scale to give experience, the commercial element must needs come in, and the possibilities of instruction are much lessened. No better teaching in many directions can be given to a student than by the deliberate production of failures in order to ascertain their causes, but this is only possible when the work is on so small a scale that profit and loss can be disregarded. At the same time one may strongly condemn that academic attitude which regards money considerations as of no moment. The cost and practicability of a process should never be lost sight of from the time that any question of practical application arises, though in the study of principles they have no importance.

I have already implied that the University has no place for the slight and superficial technology which is often called "elementary;" but the real scientific elements of the subject it must teach in order to lay a sound foundation, while in my opinion, whatever technology it does touch, it should aim at carrying to the very highest standard which can be attained. To do this, the departments must be staffed with the very best men in their respective branches, and as such men will always have careers open to them outside the academic world, liberal inducements must be offered to secure them, either in direct stipend, or the possibilities of profitable outside work. Again, the maintenance of such departments is necessarily costly, the number of students is at present generally limited, and the space and material required is much larger per student than in the ordinary science course. How then are these expenses to be met? Fees in England are already very high as compared to those in Germany, and many of the young men to whom it is most desirable in the public interest to give a complete education in technology already find the expenses difficult to meet. If fees were raised to such a standard as to pay the present actual cost, the number of students would be so much reduced as again to heavily increase the cost per head, while the numbers educated would be uselessly curtailed. Such education cannot be self-supporting, and we have only the alternatives of letting it drop, or of supporting it by public funds or private liberality. Whatever might otherwise be the economically correct course, we are left little practical choice, since Germany has set the pace and we cannot afford to drop out of the race. Having started we must do it thoroughly, for the prize is only to the winner.

The difficulty, however, is only half overcome when we have found the teaching, we have still to attract the right sort of students in sufficient numbers, and these are not found exclusively or even mainly among the wealthier classes. Originality of mind and the power of continued application to a difficult problem are rare gifts, and still more rare when combined in the same individual, yet they are absolutely necessary for the advanced technical chemist. Men who have them are worth educating even at the public cost, but it is questionable whether we succeed in getting them under our present system of scholarships; the powers which make for success in a school examination often count for very little in after life, and in fact originality rather tends to failure. I think it is worth consideration whether some of the money now spent in scholarships would not be better devoted to a general lowering of fees, so as to make the struggle a more open one, and trust to the "survival of the fittest." But if we are to continue the scholarship system, I should like to see it less dependent on mere examination results than on the opinion of the teacher. It would be no difficult matter for the intelligent schoolmaster to pick out a limited number of his most promising pupils for a year's preliminary university training

from those who had passed the test of the school-leaving or matriculation examination. These would come specially under the notice of the University Professors, who would again select or recommend those who should continue for a complete course. No favouritism would be possible, as the Professors would not act individually, but as a board of selection, and would judge not only by the regular examinations but by their personal observation of the work done in classes and laboratories. It would rarely happen that men so chosen would turn out practical failures, though other than purely scientific qualities might be taken into reckoning.

There is, however, another inducement which is needed in addition to scholarships, and which is even more efficient—I mean the reasonable prospect of a remunerative post in the future. It is not necessary, as Sir W. Ramsay remarked in his interesting presidential address, that all the prizes should be large if there are some good ones, and a reasonable chance for the rest. Employers might remember that in offering posts to young men they are not merely in many cases doing a very profitable thing for themselves, but are performing a public service in assisting the great work of education which is to train the captains, if not the generals, of the army of British industry.

So far I have spoken of the University merely as a teaching organisation, but there is another function which I regard as of, at least, equal importance, and which has been carried on in the past under the greatest difficulties—I refer to research, not merely in pure science, but in technology. As regards the application of practical processes already worked out in the laboratory, the manufacturer may be trusted to take care, but there are all sorts of broader issues, which at the moment show no prospect of profit, but which are the foundations of future advance. Unless these are investigated by scientific men, who work not merely for instant reward, and who are independent of the immediate financial result, they will not be investigated at all, and there is nowhere where the work can be done so well or so cheaply as in a university, where both the men and the appliances must be provided for teaching. Even from the teaching point of view there is nothing more calculated to develop the growing mind in the direction of practical and productive work than to see investigation and discovery going on around it, and there is no other way in which a teacher can become a living exponent of advancing science.

If, however, research is to be recognised as an important part of the duty of a university, it must be provided for and encouraged.

Discovery is a thing which cannot be commanded, but must be long and patiently sought, sometimes without result, and always with much planning how the problem is to be attacked, and meditation as to the meaning of the results actually attained. It is often necessary to spend hours apparently doing nothing, but inwardly thinking strenuously. Though this is obvious enough to the discoverer, it is often quite incomprehensible to others. I remember an inventor in the somewhat humbler walks of knowledge complaining to me that when he sat over the fire at nights thinking over his schemes, his wife could not conceive what he was doing, and blamed his laziness. I fear that too often the world in general, and specially the employer, adopts the attitude of the wife; and your discoverer is often a sensitive man who dislikes being even tacitly blamed, and turns for safety to the old routine in which immediately tangible results can be shown. It is difficult to put a limit on what might be accomplished in industry by the employer who had sufficient knowledge and tact to sympathise with the intelligent young chemist, to discuss with him the possibilities of advance, and to point out the difficulties which his practical experience told him to expect.

In a university, this want of sympathy and comprehension is not so likely to occur, but on the other hand the want of quiet and uninterrupted time for work is a great bar to success. It is but rarely that odd half hours or even odd hours can be successfully utilised; apparatus takes time to set up, and experiments must often be carried through at one sitting, but above all, time is needed for unbroken

thought, only those who have tried can know how a chance visitor or a ring on the telephone can break up a laborious and intricate chain of thought, and how long it takes to get ideas in train again. It is not merely professors but the younger staff whose opportunity for research should be amply provided and carefully guarded, and to the latter it is especially important, since published research is the only means by which they can recommend themselves for the higher posts, the hope of which induces them to work at the low salaries at present paid. For advanced students also simple experimental work on practical problems is the best possible training. For this purpose the University has decided to admit postgraduate students at very much reduced fees, and it is much to be wished that a certain number either of scholarships, and, what would probably be better, of junior posts as research assistants to professors could be created to enable promising students to complete their training in research. Such posts should of course be of a temporary character, say, for one year only, and should be awarded, not by examination, but in recognition of practical work already done.

DISCUSSION.

Prof. A. SMITHBELLs fully agreed with Prof. Procter's ideas and had never heard a more succinct account of the subject. Many factors had to be considered. Employers said the workmen's attitude often prevented successful application of science to industry. The state of affairs had much improved in the last 20 years, but was still unsatisfactory. He could not see that the professors were to blame. Material was available, but employers expected immediate returns and it was difficult to convince them that time and capital must be spent before results could be obtained. They were often reluctant to let their chemists get practical experience by having the run of the works. In ordinary business valuable services were proportionally well paid, and a good chemist would not be tempted to take his knowledge and experience elsewhere if it were made to his interest to remain.

Mr. F. W. RICHARDSON asked what a young man's aim and object was in taking up chemistry. If compelled to become a secondary chemist the outlook was poor. Manufacturers kept chemists testing samples only and expected immediate increases in income, instead of providing time and money for them to improve processes. Chemists often became managers or commercial travellers on account of the low salaries paid. He thought it was important to employ men of originality, and, as examinations were most imperfect tests, some other system was wanted to secure the man of most promising practical ability.

Mr. GEORGE WARD took exception to the depreciation of technical schools, which he thought were likely to produce in workmen-students more sympathy with, and inclination to try, new and improved processes. He thought a system of bursaries to enable promising workmen to go to universities from technical schools might be useful.

Mr. E. BREFFIT, speaking from an employer's point of view, said that college students although requiring at least three years to learn sufficient to be of value, expected high salaries at once. It had occurred to him that arrangements might be made for scholarship holders to study specified manufactures. He offered to let a college student study glass manufacture at his company's works. The worst manufacturer spoils the trade of the best, by selling below cost price. In England practically no attention had been paid to the cost of glass manufacture. In Germany and the United States the relative cost of production in all countries had been investigated. He believed that if English industry could not prosper by the application of scientific methods it could not in any other way.

Mr. BARBER thought examinations did not encourage originality or advance technical knowledge. Unsuccessful candidates often did better work afterwards in research and technology. Manufacturers were now more ready to give their sons technical training. The talent was present in both working and middle classes if only means were

devised for getting the original men rather than those who were merely successful in examinations.

Mr. PROCTER, in reply, said that even if workmen had useful ideas, it was not often that they were in a position to introduce them in practice, and their want of general scientific education rendered it very difficult for them to benefit by advanced technological instruction. It was often difficult to obtain manufacturers' consent for students to see their works, and he thanked Mr. Breffit for his offer.

Obituary.

WILLIAM CHATTAWAY, F.C.S., F.I.C.

MEMBER OF THE SOCIETY OF CHEMICAL INDUSTRY,
CHIEF CHEMIST AND MANAGER FOR THE SOCIETY OF
APOTHECARIES OF LONDON, &c.

William Chattaway was born in 1861, and commenced his professional career in 1877 with Mr. Joseph Young, chemist, Leicester, who with his pharmaceutical profession also united an extensive analytical practice. It was

under such auspices that Mr. Chattaway's practical knowledge was gained. Leaving Leicester he proceeded to Paris, where he made the acquaintance of Chevreul. This acquaintance ripened into close friendship, the aged chemist and the younger one keeping in touch with each other until the death of the former. After passing his minor and major examinations, in 1883 and 1885 respectively, William Chattaway went to Sheffield as senior assistant to the late Mr. A. H. Allen, with whom he was associated for seven years, latterly as a partner in a branch laboratory which Mr. Allen had opened in London. Mr. Chattaway rendered Mr. Allen considerable assistance in the compilation of portions of his *Commercial Organic Analysis*. When the late Mr. R. H. Davies was taken ill, Mr. Chattaway was temporarily appointed as chief chemist and manager of the Apothecaries' Hall, and was confirmed in the appointment when Mr. Davies died in 1893. Mr. Chattaway was also public analyst for the boroughs of Hammersmith and Colchester. He was, moreover, recently commissioned by the Pharmacopœia Committee of the General Medical Council to prepare a digest of published researches and criticisms bearing upon the matter of the latest edition of the *British Pharmacopœia*. Mr. Chattaway was greatly interested in photography, and had done some good work on colour photography. He died on Oct. 7th, at the age of 43.

Journal and Patent Literature.

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I.—PLANT, APPARATUS, AND MACHINERY.

ENGLISH PATENTS.

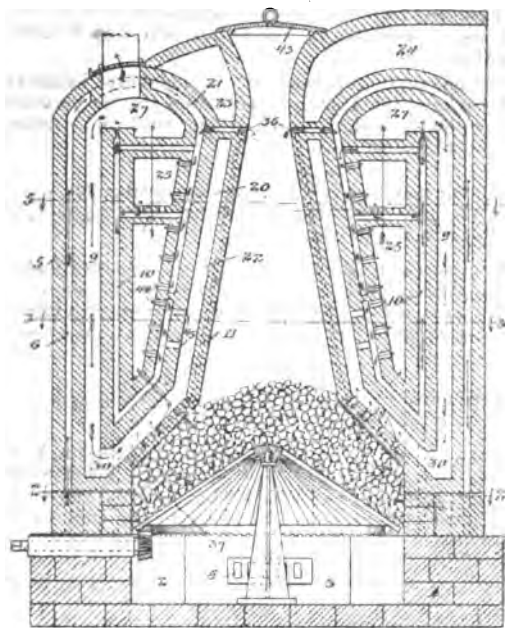
Furnaces; Impts. in — F. J. Doyle, Chicago.

Eng. Pat. 22,057, Oct. 13, 1903.

THE furnace consists of an outer cylindrical shell 5, supported on a suitable base 1. The dome-shaped grate 37 is supported above the ash-pit 2 by the pillar 38, and can be rotated by the mechanism 42, 40, and 39. The ash-pit 2 has a door 3 provided with an adjustable damper 4 for controlling the supply of the "initial air." Openings in the shell, not shown in the figure, are left at intervals around

the grate for stoking. The fuel chamber is formed by the inner sloping wall 11, which, after contracting to the throat at 36, widens again to allow the fuel to be easily charged through the opening at the top, which is closed by the cover 43. The products of combustion pass from the lower part of the fire-box to the primary combustion chamber 25, and thence through the space 27 to the downtake passage 9, through the openings 30, and the uptake passage 22 to the final mixing chamber 23, and away by the passage 24. The air for combustion enters by the passage 6, and flows through the heating passages 21, 20, and 10, one portion going by the openings 44 to the primary combustion chamber 25, and another portion by the perforations 45 to

the uptake 22, the direction of the air and gases being indicated by the arrows. Another form of the furnace, applicable to firing a boiler, has an annular fuel chamber,



with suitable charging hoppers. The gases and heated air, after circulating in a somewhat similar manner, finally pass through a central vertical chamber to the boiler flues.

—W. H. C.

Pasty or Fluid Substances; Apparatus for Drying — A. Huillard, Paris. Eng. Pat. 24,931, Nov. 16, 1903.

AN endless band of metal netting is caused to dip in a trough containing the substance to be dried; it thus carries forward a certain quantity of the substance in its meshes, and is passed into a chamber divided by a series of baffle-plates into a number of compartments. The metal band travels over and under a series of upper guide rolls and a series of lower driving rolls, arranged alternately, and is thus conducted in a zigzag path through all the compartments, whilst a current of heated air is passed in an opposite direction. When the metal band emerges from the drying chamber, the dried material is removed by a number of rotary brushes. A tension arrangement is provided which releases the tension on the cloth intermittently by the action of a cam.—J. F. B.

Mixing, Emulsifying, and Homogenising Liquids; Apparatus for — G. A. Bounet, Paris. Eng. Pat. 14,621, June 29, 1904. Under Internat. Conv., July 1, 1903.

SEE Addition, of June 21, 1904, to Fr. Pat. 333,501 of 1903, following these. —T. F. B.

UNITED STATES PATENTS.

Drying Apparatus. F. Meyer, Chicago. U.S. Pat. 771,994, Oct. 11, 1904.

A ROTARY drum, having two annular rows of shelves and a central tube extending throughout its length, is mounted in a heating chamber. The fire gases pass first along the outside of the drum, and return through the same to the outlet. Means are provided for feeding the material to be dried, and for drawing the gases through the drum.

—W. H. C.

Drying Apparatus. H. Hencke, Berlin. U.S. Pat. 773,390. Oct. 25, 1904.

A CONTINUOUS band passes over and between a series of rotating hollow cylinders, which have perforated surfaces, and are provided with means for sucking air and liquid from

their interior. The largest of the cylinders is partly surrounded by a perforated casing, the space between the surface of the cylinder and the casing decreasing in the direction of the rotation of the former, and an outer tank surrounds cylinder and casing. Means are provided for removing the dried material from the band, and for washing the latter.—W. H. C.

Distilling and Evaporating Apparatus. W. H. Geaner, Assignor to the Caribbeau Manufacturing Co., New York. U.S. Pat. 773,139, Oct. 25, 1904.

A SCREW conveyor has a portion of its convolutions solid, and a portion hollow and perforated, with means for supplying heat to the latter. The whole is situated in a perforated tubular case, which is surrounded by a larger, outer, non-perforated casing. The space between the two cases is connected to a condenser, and a current from the apparatus to the condenser is induced by a fan.

—W. H. C.

Centrifugal Machine. T. S. Patterson, New York, Assignor to the Oil and Waste Saving Machine Co., Rochester, N.Y. U.S. Pat. 773,220, Oct. 25, 1904.

THE rotating drum of the machine is provided with perforations on its side wall, and is mounted vertically in a steam casing, having a suitable steam inlet and outlet, and a trapped cover. The drum is rotated by means of a turbine placed directly beneath it and in the casing. A pipe is arranged to deliver steam against the vanes of the turbine.

—W. H. C.

Centrifugal Machine [Separator]. A. J. Ericsson, Assignor to Aktiebolaget Separator, Stockholm. U.S. Pat. 773,489, Oct. 25, 1904.

SEE Fr. Pat. 342,115 of 1904; this J., 1901, 895.—T. F. B.

Furnace. E. Lane, Kansas City, Mo. U.S. Pat. 773,328, Oct. 25, 1904.

THE furnace has front and rear combustion chambers, which increase in cross-sectional area from front to rear, and which are separated by a wall, and connected by an opening in the wall and by a flue. A boiler having a flue of increasing cross-sectional area from front to rear, is interposed between the rear combustion chamber and the stack.

—W. H. C.

Filter-Press. J. W. Neill, Salt Lake City, Utah. U.S. Pat. 772,472, Oct. 18, 1904.

THE press consists of a vertical cylinder, the bottom of which is formed by the filtering medium, supported by a suitable plate. A reciprocating plunger works in the cylinder and forces the liquid through the filtering medium. Means are provided for actuating the plunger, for feeding the liquid to be filtered, and for controlling the feed.

—W. H. C.

Filtering Apparatus. H. R. Cassel, Colorado Springs, Colo. U.S. Pat. 773,473, Oct. 25, 1904.

A TANK is combined with enclosed filtering cells having a suction-pump connected thereto. The apparatus has a removable bottom, with means for raising and lowering the same. Means are provided for withdrawing the "pulp" from the bottom of the apparatus and distributing it at the top.—W. H. C.

FRENCH PATENTS.

Retort Furnaces; Inclined — E. Derval. Second Addition, dated June 4, 1904, to Fr. Pat. 321,154, May 3, 1902.

SEE Eng. Pat. 21,964 of 1903; this J., 1904, 859.—T. F. B.

Liquids; Process for Desiccating [Evaporating] — W. D. Neel. Fr. Pat. 344,072, June 15, 1904.

SEE Eng. Pat. 13,186 of 1904; this J., 1904, 814.—T. F. B.

Heating Fluids of all kinds; Utilising the Heat of [Chemical] Reactions for — A. Lang. Second Addition, dated June 17, 1904, to Fr. Pat. 331,997 of May 12, 1903.

IN order to set fire to the mixture which, on combustion, is to give out heat, there is embedded in it a conical cup

containing a layer of aluminium mixed with some peroxide, and this is covered by a layer of a mixture of magnesium and potassium chlorate. The layer of magnesium is hermetically covered by a plate of celluloid; and this may be ignited by means of a match. (See also this J., 1904 537.)—L. F. G.

Heat liberated by the Crystallisation of Saturated Solutions; Utilising — L. J. J. B. Chèneau. Fr. Pat. 344,513, July 1, 1904.

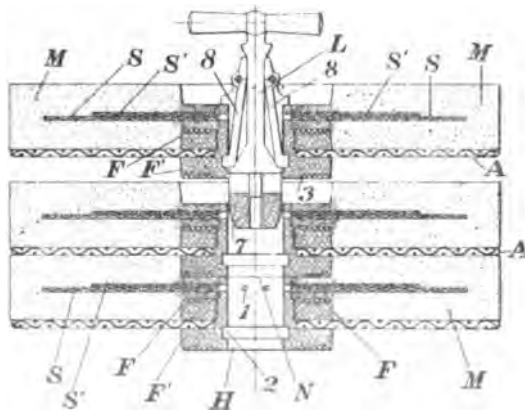
CRYSTALLISED strontium hydroxide is dissolved in boiling water to saturation, and the solution is run into suitable vessels, as into the warmers for railway carriages, for supplying heat continuously as long as crystallisation proceeds. The product when cold is stated to be, not a solid, but a pasty mass, putting no strain upon the containing vessel.—E. S.

Filtering Liquids; Apparatus for — A. J. Hosier, A. Whatley, and W. Kelly. Fr. Pat. 344,089, June 17, 1904.

THE liquid filters through a fine copper or brass sieve contained in a drum suitably rotated, and the residue accumulating on the sieve is swept out by a rotating brush, driven by a belt and pulleys from the shaft rotating the drum, and falls into an outer casing, from which it is removed.—L. F. G.

Filter Element, and Method of Construction. K. Kiefer. Fr. Pat. 344,254, June 24, 1904.

EACH "element" of the filter is formed of a metal tube H, having a flange F' and a collar F, between which a disc of coarse wire gauze A is held, and which serves to separate the "elements" from one another, and to allow the liquid which is to be filtered, to reach the filtering medium. The latter, which consists of two layers of compressed paper pulp M, between which layers of fine wire gauze S, S', of less diameter than the layer of pulp, are placed. The mesh of this gauze is of sufficient fineness to prevent the fibres of the pulp passing through, but allows the filtered liquid to flow through and away by the openings 1, to the central



tube. The central portion of the pulp is more strongly compressed than the outer portion, as indicated by the darker shading, in order to prevent the passage of the liquid laterally to the central tube, and to allow the corrugations of the plates F, F' to form a tight joint between two "elements." In use, a number of these elements are joined together and placed in a suitable vessel, fed with the liquid to be filtered. The process of forming the "elements" is as follows: A suitable quantity of paper pulp is put into a circular vessel, having a central vertical core, and filter bottom which can be forced upwards. The fine gauze discs are next placed on the surface of the pulp, and then another portion of the latter. The vessel having been closed by a lid, the bottom is forced upwards and the pulp compressed. After releasing the pressure, lowering the central core, and

removing the cover, the coarse gauze disc and the central tube are inserted, and the complete "element" removed by a special instrument and placed in the filter.—W. H. C.

Filters; Impts. in — Mme. H. Breyer, née Mitterbacher, and A. Jurnitschek de Wehrstedt. Fr. Pat. 344,351, June 27, 1904.

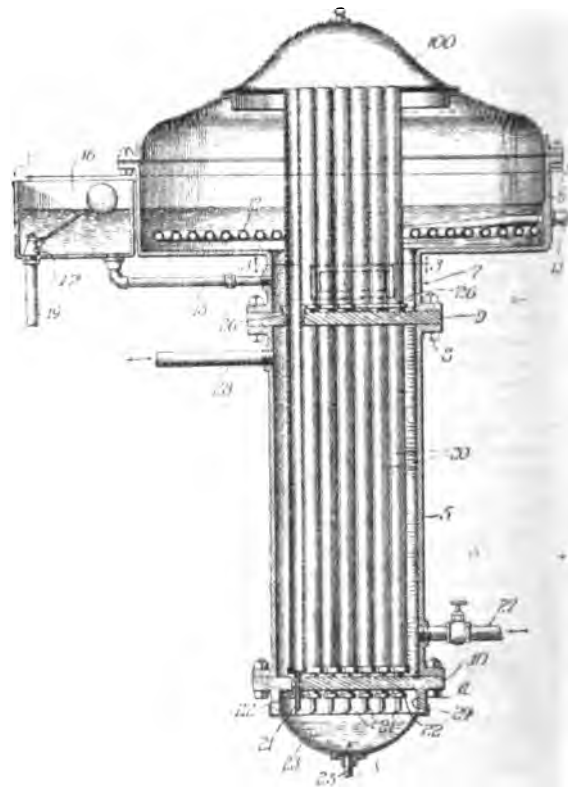
THE filtering medium is composed of well-burnt bricks or tiles, reduced to a sufficiently fine condition that the particles adhere to the filter cloth, which is supported on a vertical perforated plate.—W. H. C.

Emulsifying and Mixing Liquids; Apparatus for — G. A. Bonnet. First Addition, dated June 21, 1904, to Fr. Pat. 333,501, July 1, 1903.

THE liquids to be mixed are forced under pressure into a vertical cylinder, in which slides a piston on which a certain pressure is exerted by a spring. The liquids are then forced through a series of fine holes into a central exit channel, and thus mixed.—L. F. G.

Distillation; Apparatus for — I. H. Jewell. Fr. Pat. 344,363, June 28, 1904.

A BOILER or still 6 having a cylindrical extension 7, is bolted to a flanged cylinder 5, which forms the condenser. The plate 9, interposed between the flanges, serves to separate the still from the condenser. The still, which may be heated by a steam coil 12, 13, as shown, or by a ring of gas burners placed below, has a dome-shaped cover, part of which, 100, is easily removable. The water,



or other liquid to be distilled, is supplied from the ball-tap cistern 16, and is kept at a constant level. The vapour passes through the tubes 20, which are fastened into the plate 9 by the nuts 26, and is condensed by means of water, which enters at 27 and leaves at 28. The bottom of the condenser is formed by the plate 10, through which the ends of the tube 20 pass, and a vessel 23 is fixed below to collect the distillate.—W. H. C.

II.—FUEL, GAS, AND LIGHT.

Benzene in Illuminating Gas; Determination of —
O. Pfeiffer. XXIII., page 1116.

Soap and Candles; Manufacture of —
J. Lewkowitsch. XII., page 1100.

ENGLISH PATENTS.

Fuels; Method and Apparatus for Determining the Heating Value of Gaseous and Liquid — H. Junkers. Eng. Pat. 18,437, Aug. 26, 1904. XXIII., page 1116.

Gas Producers. J. G. Nash, Adelaide, Australia. Eng. Pat. 17,712, Aug. 13, 1904.

A FEEDING device, comprising a cylinder and reciprocating plunger, is arranged upon the side of the producer for charging bituminous fuel into the incandescent zone of the fuel within the producer. At suitable intervals a quantity of the coal may be allowed to rest in the cylinder until it has become coked by the heat from the interior of the producer, whereupon the coke is withdrawn through a side shoot. At the top of the producer is provided an arrangement for feeding coke or the like, and at the bottom is a water-sealed fire-grate and an inlet for the air blast. The valves controlling the air blast and a blow-off pipe for surplus gas are connected to a gas-holder, so that the production and storage of gas cease when the gas-holder is full. The apparatus is provided at various points with pokers, working through ball-and-socket bearings, for loosening fuel, clearing flues, &c.—H. B.

Gas Retorts [Continuous Carbonisation]. J. Verdier and P. Teulon, Marseilles. Eng. Pat. 18,364, Aug. 24, 1904. Under Internat. Conv., Sept. 2, 1903.

A VERTICAL retort is provided at the top with a feeding device, and at the bottom with a discharging device, each of these consisting of a rotatable plug provided with a cavity. The feeder and discharger are rotated continuously by means of suitable gearing, whilst a conveyor serves to bring fresh coal to the charging hopper and to remove the coke as discharged.—H. B.

Gas-testing Apparatus. A. H. Lynn. Eng. Pat. 23,771, Nov. 3, 1903. XXIII., page 1113.

Cement or Moulded Articles; Apparatus and Process for Utilising Gas Lime or other Calcium Compounds and Clinker, Slag, or other Silicious or Aluminous Material for the Manufacture of — J. Bond. Eng. Pat. 23,213, Oct. 27, 1903. IX., page 1091.

Incandescence Bodies for Electric Glow Lamps; Manufacture of — C. D. Abel, London. From Siemens and Halske A.-G., Berlin. Eng. Pat. 20,277, Sept. 20, 1904.

INCANDESCENCE filaments are made of molybdenum, thorium, tungsten, zirconium, or an alloy of any of these metals with each other, or with other metals fusible with difficulty, the metal or alloy being completely free from all non-metallic substances. The metal is used in the form of drawn wires, preferably drawn from metal which has been fused previously, as, for instance, by passing an electric current through it in a vacuum or in an indifferent atmosphere.—H. B.

UNITED STATES PATENTS.

Carbon Analysis; Method of — G. O. Seward, Assignor to Eimer and Amend. U.S. Pat. 773,529, Oct. 25, 1904. XXIII., page 1115.

Gas; Apparatus for Manufacturing — R. Dempster, Marietta, Ohio. U.S. Pat. 772,524, Oct. 11, 1904.

THE apparatus consists of a retort formed of a number of superposed chambers connected together and heated externally. Inside the chambers, perforated tubes, surrounded with a finely-divided packing material, extend from one end to the other. Air-supply pipes lead into one end, and air-

and oil-supply pipes into the other end of each of the chambers, the volumes of gas being intermingled by passing through the packing material. See also U.S. Pats. 692,771, 703,901, and 743,468; this J., 1902, 600, 1128; 1903, 1287. —W. C. H.

Gas Producers. J. A. Herrick, Philadelphia, Pa. U.S. Pat. 773,143, Oct. 25, 1904.

THE producer is provided with a grated lid, in the openings of which, bricks are seated which extend beyond the inner face of the grating, and their surfaces are exposed to tarry products distilled from fuel in the producer.—W. C. H.

FRENCH PATENTS.

Gas-Retort Furnaces. E. Derval. Fr. Pat. 389,915, Sept. 5, 1903.

THE furnace is constructed so as to have a gas-producer and a recuperator situated entirely beneath the retort bench, and separated from one another by the flue which leads to the chimney.—H. B.

Gas-Producer. G. zur Linden. Fr. Pat. 344,069, June 15, 1904.

To prevent the adhesion of clinker to the interior walls of the producer, the walls are kept cool by means of currents of steam. For example, the whole of the lining of the chamber may be provided with perforations and horizontal and vertical slits, through which steam is introduced; or the lining may have the form of a succession of annular, sloping projections, beneath which, when the producer is filled with fuel, there are left open annular spaces into which steam is introduced.—H. B.

Gas or Vapour and Air, or a Mixture of Gas and Air, for Combustion; Method and Apparatus for Obtaining — The Scott-Snell, Phillips Syndicate, Ltd. Fr. Pat. 344,020, June 16, 1904.

THE apparatus comprises a water-sealed bell, a motor which, acting through a mechanism similar to that used in phonographs, alternately raises and lowers the bell, and a hollow valve (either a slide valve or a rotating valve), which is caused to move synchronously with it, and is brought successively into communication with an air-inlet, a gas-inlet, and an outlet to the main for the mixed gas. During the ascent of the bell, the valve-opening remains in communication first with the air-inlet, and then with the gas-inlet, so that definite proportions of air and gas are aspirated into the bell; whilst during the descent of the latter, the valve opening communicates with the main, into which the combustible mixture is expelled under pressure. An automatic check is provided between the motor and the intermediate driving mechanism, such that the motor does not begin to operate until the latter requires to be wound up again. By enclosing the whole bell within a casing communicating with a modified form of valve, the apparatus may be rendered double-acting, the bell, whilst rising, acting as a compressor upon the gaseous mixture which it has drawn into the casing during its descent, and simultaneously drawing air and gas into its interior, as in the arrangement first described above.—H. B.

Gas-Producers. G. Gautier. Fr. Pat. 344,102, June 17, 1904.

THE producer, which is adapted for use with bituminous coal, has an annular boiler surrounding the foot of the combustion chamber, and part of the steam generated is led, along with air, up beneath the rotating conical fire-grate for the production of gas as usual. Another portion of the steam generated, is led through a coil immersed in cold water, and the saturated water-vapour thus obtained is introduced, at various heights, into the interior of the producer, so as to mix with the gas as it is formed. It is said that the water particles bring about a condensation of the heavier tarry matters within the producer itself, where they are burned. The gas is passed through a vertical, tubular washer, where it encounters showers of water, and after further washing it enters a gas-holder, which, when it is quite full of gas, automatically shuts off the supplies of steam and air to the producer.—H. B.

Air Gas; Process of Manufacturing — in the Cold by means of Liquid Hydrocarbons, Alcohol, &c. E. Gersabeck. Fr. Pat. 344,205, June 22, 1904.

THE air is passed through a fixed or rotary carburettor having partitions which cause the air to pursue a tortuous course, the compartments being provided with porous material, the lower portion of which dips into the carburetting liquid.—H. B.

Producer for Weak Gas. N. A. Mougeotte. Fr. Pat. 344,243, June 23, 1904.

A CASING, provided with a refractory lining, which constitutes the combustion chamber of the producer, is suspended within two concentric casings, which thus form two concentric annular spaces, at the top of which there is a steam generator surrounding the fuel hopper. The hot gases produced, are led down the outer annular space, so that the entire apparatus is bathed in them, and loss of heat is reduced to a minimum. Two intertwined helical pipes fixed within the outer annular space conduct the air required for combustion, from the outer air to the steam generator, the air thus becoming highly heated. The mixture of steam and air is led down the inner annular space to the foot of the combustion chamber, whence it ascends through the fuel. The elimination of dust from the gas is favoured by the gas having to pursue a helical course between the coiled pipes in the outer jacket, and additional devices for the removal of dust are provided at the base of the apparatus near the outlet.—H. B.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM AND MINERAL WAXES.

Lignite Tar; Bases in —. H. Ihlder. Z. angew. Chem., 1904, 17, 1670—1671.

THE author has previously isolated from the bases of lignite tar the three picolines and the $\alpha\alpha'$ -, $\alpha\beta'$ -, and $\alpha\gamma$ -dimethylpyridines. He has sought to isolate, though without success, the $\alpha\beta$ - and the $\beta\beta'$ -isomerides, the latter of which Ahrens and Gorkow found in coal tar (this J., 1904, 654); but from the fraction of b. pt. 160°—155° C., by fractional precipitation with mercuric chloride, he has obtained, besides the $\alpha\gamma$ -isomeride, compounds which he has identified as those of $\beta\gamma$ -dimethylpyridine. From the fraction of b. pt. 220°—230° C. he has further obtained a precipitate with mercuric chloride. The small quantity of base regenerated from this did not allow of the determination of its b. pt., but the behaviour of its oxidation product leaves little doubt of its being $\alpha\beta\gamma\delta$ -tetramethylpyridine.—J. T. D.

Petroleum and its Distillation Products; Action of Formalin on — [Formolit]. A. Nastjukow. J. russ. phys.-chem. Ges., 1904, 36, 881—898. (Chem. Centr., 1904, 2, 1042—1043.)

IF sulphuric acid (1 vol.) and formalin (1½ vols.) be added to refined petroleum (1 vol.), a vigorous reaction ensues, and a solid product separates, which the author names "formolit." It is a yellowish-brown amorphous substance (probably a mixture), infusible, and insoluble in the ordinary solvents. The yield of "formolit" from the distillates of a specimen of petroleum increases with the boiling point of the fraction. The yield of "formolit" from different kinds of petroleum varies; for example, petroleum from Saurachan and Tiflis yields less than 5 per cent.; that from Tschelen, Ljankan (Ferghana), Binagady (near Baku), and part of that from Balachany yield 17—18 per cent.; that from Grosny and Balachany yields 23—24 per cent.; and petroleum from Bibi-Eibat and Kuban yields 37—38 per cent. of "formolit." Experiments with a large number of different hydrocarbons showed that only cyclic, unsaturated hydrocarbons react with formalin. When "formolit" is subjected to destructive distillation, saturated hydrocarbons are mainly obtained; only 6.16 per cent. of the distillate is capable of again reacting with formalin. From the yield of "formolit" the amount of unsaturated

cyclic hydrocarbons in a specimen of petroleum can be determined. If the yield of "formolit" be less than 50 per cent., the proportions of sulphuric acid and formalin given above will answer the purpose, but if the yield be 50 per cent. or more, the proportions of petroleum, sulphuric acid, and formalin should be 1 vol. : 2 vols. : 1 vol. The weight of "formolit" multiplied by 9.8 gives the amount of unsaturated cyclic hydrocarbons.—A. S.

ENGLISH PATENTS.

Hydrocarbon Derivatives; Process for the Production of Water-Soluble or easily Emulsifiable —. W. P. Thompson, London. From Ges. z. Verwertung der Boleg'schen Wasserlöslichen Mineralöle und Kohlenwasserstoffe G. m. b. H., Berlin. Eng. Pat. 22,091, Oct. 13, 1903.

SEE Fr. Pat. 338,738 of 1903; this J., 1904, 655.—T. F. B.

Vaseline; Process for Production of Water-Soluble or Emulsifiable —. W. P. Thompson, London. From Ges. z. Verwertung der Boleg'schen Wasserlöslichen Mineralöle und Kohlenwasserstoffe G. m. b. H., Berlin. Eng. Pat. 22,092, Oct. 13, 1903.

SEE Fr. Pat. 338,640 of 1903; this J., 1904, 655.—T. F. B.

UNITED STATES PATENT.

Pine Oils from Wood; Process of Manufacturing —. F. S. Clark and E. A. Harris, Assignors to Georgia Pine Turpentine Co., New York. U.S. Pat. 771,859, Oct. 11, 1904.

THE tar and heavy oils are removed by condensation from the vapours arising from the distillation of wood, and steam is introduced into the residual vapours, which are then treated with a caustic alkali (e.g., lime) to remove acetic acid and creosote, the temperature being maintained during this treatment above the boiling point of the lighter oils. The purified vapours are subjected to fractional condensation, to separate the "bad-smelling oils" from the pine oils.—T. F. B.

FRENCH PATENTS.

Pitch; Apparatus for Running-off and Cooling —. Cie. Paris. d'Eclairage et de Chauffage par le Gaz. Fr. Pat. 344,485, June 30, 1904.

THE molten pitch falls from a number of small openings in a tank into a similar number of small troughs situated side by side on the circumference of a wheel, which is rotated in a plane perpendicular to the line in which the orifices in the tank are disposed. This wheel is fixed near the top of a large tank filled with water to such a height that only the small troughs at the top of the wheel at any time are out of the water. Small jets of water are projected on to the pitch as it flows into the troughs, thus causing a sudden cooling. The troughs are normally bottomless, but temporary bottoms are provided for those at the top of the wheel, in the form of plates, which are pressed by springs against the under-side of the troughs. The pieces of pitch in the troughs thoroughly cooled by passing through the water, fall out of the troughs when they reach the lowest position of the wheel, and are received on an endless conveyor, which rotates in the tank, passed thence on to a convenient number of other rotating conveyors, and finally deposited in the buckets of an elevator, which removes them from the tank. A device for forcing the pieces of pitch out of the small troughs when necessary is described, and forms the subject of one of the claims.—T. F. B.

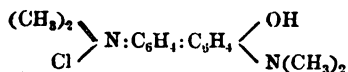
Petroleum; Process for Refining —. A. J. Durupt. Fr. Pat. 344,129, June 18, 1904.

PETROLEUM, freed from sulphur compounds, is mixed with stated proportions of such mineral oil as "vaporine," &c., denatured alcohol, and middle oils of coal tar, previously freed from naphthalene and anthracene. The mixture is distilled, the first portion of the distillate being suitable for motor purposes, whilst the remainder is said to consist of a very pure petroleum. The residue, when mixed with rosin or pitch, is stated to be suitable for caulking purposes.—T. F. B.

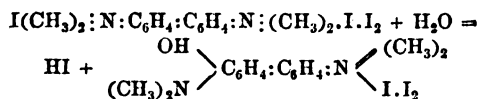
IV.—COLOURING MATTERS AND DYE STUFFS.

Quinonoid Derivatives of Benzidine. R. Willstätter and L. Kalb. Ber., 1904, 37, 3761—3775.

BENZIDINE and its alkyl derivatives give rise, on gentle oxidation, to coloured compounds which form two series of coloured salts, a green series and a yellow one. If tetramethyl benzidine, which is prepared by the oxidation of dimethylaniline, be oxidised with ferric chloride in presence of hydrochloric acid, dark green needles separate out which appear to have the formula $C_{16}H_{20}N_2Cl + 2H_2O$, but cannot be accurately analysed, as they decompose very rapidly and smell strongly of formaldehyde. The dry substance forms a black-violet powder, and dissolves in water or acetic acid with a deep green colour; mineral acids change the colour to orange yellow. The green salt appears to be half a quinoneimmonium salt and half an amino-quinol, and to have the formula—



On reduction this gives tetramethyl benzidine. If chlorine be led in excess into a cooled solution of tetramethylbenzidine in alcohol and sulphuric acid, an acid sulphate of the oxidation product crystallises out in red prisms. Analysis agrees fairly with the formula $(C_{16}H_{20}N_2)SO_4 \cdot H_2SO_4 + 2H_2O$, but this sulphate is still less stable than the green chloride, and also smells of formaldehyde. It dissolves in water with an orange-yellow colour. The yellow salts appear to be quinone-di-imonium salts, and the sulphate to have the following formula: $HO_2S(CH_3)_2 : N : C_6H_4 : C_6H_4 : N : (CH_3)_2 \cdot SO_4H + 2H_2O$. The green chloride dissolves in dilute hydrochloric acid with formation of the yellow chloride, which may be precipitated with platinum chloride as a double salt of the composition $C_{16}H_{20}N_2Cl_2Pt + 2H_2O$. If potassium iodide be added to a solution of the green chloride in 10 per cent. hydrochloric acid, a reddish-brown amorphous precipitate of the periodide is formed, which is a quinone-di-imonium salt, and belongs to the yellow series. On adding excess of water to the red periodide suspended in water, it changes at a certain dilution, into a black body with green reflection; this belongs to the green series, and an atom of iodine has been replaced by a hydroxyl group—



Sulphur dioxide reduces the green chloride and forms a mixture of a mono-sulphonic acid of tetramethylbenzidine, m. pt. $261^{\circ} \cdot 5$ C. and of tetramethylbenzidine. The symmetrical N, N'-dimethylbenzidine is prepared as follows:—Benzidine is dissolved in water and treated first with toluene sulphochloride and then with caustic soda; the ditoluene sulphamide, $(C_6H_4 \cdot NH \cdot SO_2 \cdot C_6H_5)_2$, is then methylated with dimethyl sulphate, and the compound formed, $(C_6H_4 \cdot N(CH_3)_2 \cdot SO_2 \cdot C_6H_5)_2$, is heated with sulphuric acid to liberate the free N, N'-dimethylbenzidine, $CH_3 \cdot HN \cdot C_6H_4 \cdot C_6H_4 \cdot NH \cdot CH_3$, which crystallises from ligroin in snow-white feathery crystals, melting at 74° — 76° C. On oxidation, dimethylbenzidine shows very similar colour reactions to the tetramethyl compound. Ferric chloride forms a green quinonoid chloride. Platinum chloride precipitates a double salt in golden-brown prisms, from a solution of the green chloride in 20 per cent. hydrochloric acid. This has the formula $C_{14}H_{16}N_2Cl_2Pt + H_2O$, and is a quinone-di-imonium salt of the yellow series.—A. B. S.

Acetone-dioxalic Ester (Desmotropy and Dyeing Properties). R. Willstätter and R. Pummerer. Ber., 1904, 37, 3733—3740.

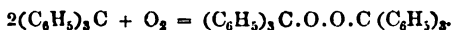
ACETONE-DIOXALIC ester, which is obtained by the action of sodium ethylate on a mixture of acetone and oxalic ester,

consists of a mixture of two desmotropic forms. One of these, which forms the chief product of the reaction, is nearly colourless, and forms prisms melting at 104° C. This body has no dyeing properties, and appears to be the mono-enolic form, and to have one of the following formulæ:— $COOR \cdot CO \cdot CH : C(OH) \cdot CH_2 \cdot CO \cdot COOR$ or $COOR \cdot CO \cdot CH_2 \cdot CO \cdot CH : C(OH) \cdot COOR$. The second form can be obtained from the first by treating it with caustic soda solution, and liberating the free ester with hydrochloric acid. It is apparently the di-enolic form with the following formula: $ROOC \cdot C(OH) : CH \cdot CO \cdot CH : C(OH) \cdot COOR$. It forms lemon-yellow needles, m. pt. 98° C. The alcoholic solution dyes wool a deep yellow fast to spirit; acid prevents the dyeing. On chrome-mordanted wool it gives a brownish-yellow shade at once, but on long boiling, the ester is decomposed and the saponification products fixed on the wool. Alkalis convert the mono- into the di-enolic form, whilst acids have a "ketonising action" and reverse the process. It is interesting to note that this is the first nitrogen-free dyestuff of the fatty series.

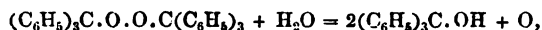
—A. B. S.

Triphenylmethyl. X. M. Gomberg and L. H. Cone. Ber., 1904, 37, 3538—3547. (See this J., 1904, 711.)

It has been shown previously that triphenylmethyl is oxidised by the air to triphenylmethyl peroxide. Determinations of the amount of oxygen absorbed showed that the reaction proceeds quantitatively according to the equation—



Determinations of the amount of the peroxide produced by weighing the oxidation product after purifying it by washing with ether, in which the peroxide is insoluble, gave results corresponding to a yield of 80 per cent. The low yield appears to be due to the decomposition of the peroxide formed, an oily substance soluble in ether being produced. By the action of sulphuric acid, triphenylmethyl peroxide is decomposed at the ordinary temperature, according to the equation—



a yield of 80 per cent. of the theoretical amount of triphenylcarbinol being obtained. The oxygen produced is not evolved in measurable quantities, but acts, in the nascent state, on a portion of the carbinol. Triphenylmethyl peroxide dissolves in sulphuric acid to a deep red solution, in the same way as triphenylcarbinol, the colour being probably due to formation of triphenylmethyl sulphate. The latter compound was prepared by acting with silver sulphate on triphenylchloromethane dissolved in liquefied sulphur dioxide. It is a dark red substance, and forms solutions of an intense red colour. By treating triphenylmethyl peroxide with halogens under varying conditions, triphenylbromomethane pentabromide, triphenylmethyl bromide, triphenylbromomethane penta-iodide, and triphenylmethyl chloride were prepared. By the action of phosphorus pentachloride on triphenylmethyl peroxide above 100° C., the primary reaction products appear to be benzophenone chloride and triphenylmethyl chloride, but the latter decomposes further with formation of diphenylenephylmethane. A solution of triphenylmethyl in benzene is rapidly decolorised when exposed to direct sunlight, the weight of the product after the exposure amounting to 105 parts for each 100 parts of triphenylmethyl; 65 per cent. of the final product consists of triphenylmethane. In carbon tetrachloride solution the decomposition proceeds more rapidly, but no triphenylmethane is produced. In neither case could hexaphenylethane be detected in the product after exposure to light.—A. S.

Rosaniline; The Triboluminescent Parent Hydrocarbon of — A. Bistrzycki and J. Gyr. Ber., 1904, 37, 3696—3699.

SPECIMENS of diphenyl-m-tolylmethane obtained by the authors (this J., 1904, 542) and by Hemilian synthetically, and of the root hydrocarbon of rosaniline, prepared by E. and O. Fischer, are found to be identical as regards melting point, behaviour towards sulphuric acid, and crystalline

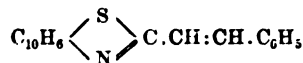
structure; also they all exhibit a feeble blue triboluminescence; that shown by Fischers' hydrocarbon is much feebler than in the other specimens, but this property appears to depend largely upon the size and form of the crystals. Hence there appears to be no doubt as to the identity of the three specimens. Neither diphenyl-*o*-tolylmethane, nor diphenyl-*p*-tolylmethane, nor diphenyl-*m*-tolylcarbinol exhibit this triboluminescence. On gentle oxidation, diphenyl-*m*-tolylmethane is converted into the carbinol, whilst more energetic oxidation results in the formation of triphenylcarbinol-*m*-carboxylic acid.—T. F. B.

Tetrahydroxycyclohexane-Rosanilines. J. Schmidlin.
Comptes rend., 1904, 139, 676.

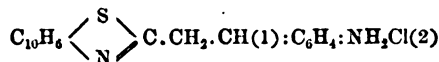
LAMBRECHT and Weil have recently described a colourless oxalate of Malachite Green, to which they ascribed the formula $C_{22}H_{20}ON_2 \cdot 2C_2H_2O_4 \cdot 3H_2O$. This salt loses 4 mols. of water when heated at 70° C., forming the coloured oxalate of Malachite Green, $C_{22}H_{20}N_2 \cdot C_2H_2O_4$. In its other properties also it resembles the derivatives of the tetrahydroxycyclohexane-roosanilines described by the author (this J., 1904, 979), who considers that the 3 mols. of water shown in Lambrecht and Weil's formula do not represent water of crystallisation, but enter into the constitution of the compound, which may be represented by the formula $[C_2H_2O_4 \cdot (CH_2)_2 \cdot N \cdot C_6H_4]_3 [C_6H_4 \cdot CH(C_6H_4(OH)_2 \cdot N(CH_2)_2 \cdot C_6H_4O_4)]$. It is probable, however, that one of the hydroxyl groups is united to the methane carbon, as the colourless oxalate is obtained by the direct action of oxalic acid on Malachite Green carbinol. This fact is considered by the author to be a proof of the intermediate formation of hexahydrobenzene derivatives in the transformation of the benzenoid carbinol compounds into the coloured quinonoid rosaniline salts.—A. S.

Methinammonium Dyestuffs. H. Rupe and G. L. M. Schwarz. Z. Farben- u. Textil-Ind., 1904, 3, 397—402.

If acetylated- β -naphthylamine be mixed with phosphorus pentasulphide a thioacetnaphthalide is formed, which, on oxidation with potassium ferricyanide, gives β -naphthothiazole. The latter condenses with benzaldehyde and its derivatives when heated together with zinc chloride in an atmosphere of carbon dioxide. Benzaldehyde gives cinnamyl-naphthothiazole—



o-Aminocinnamyl- β -naphthothiazole is obtained by reducing *o*-nitrocinnamyl- β -naphthothiazol. The hydrochloride of this base dyes tanned cotton in yellow shades, which are, however, not fast. Its formula may be written in the quinonoid form thus—



The corresponding meta compound has no dyeing properties, and cannot be represented by a quinonoid formula. The para compound dyes better than the ortho. The corresponding compounds of α -naphthothiazole show similar dyeing properties. The amino derivatives of both cinnamyl-naphthothiazoles are dyestuffs when the NH_2 group is in the ortho or para position to the $-CH=CH-$ group. The meta derivatives have no dyeing properties. A quinonoid formula can be written for the former, but not for the latter.—A. B. S.

Aromatic Esters; Electrolytic Reduction of —.
C. Mettler. XI. A., page 1096.

ENGLISH PATENTS.

Sulphurised [Sulphide] Dyestuffs; Manufacture of New —. E. E. Naef and I. Levinstein (Levinstein, Ltd.), Manchester. Eng. Pat. 26,700, Dec. 7, 1903.

PARANITROSOPHENOL, *p*-nitroso-*o*-cresol, or homologous or analogous compounds are condensed with aminosulphonic acids of the benzene or naphthalene series which have the

p-position to the amino group unoccupied. The resulting solution is precipitated by means of sodium carbonate, and the precipitate either converted directly into a sulphide dyestuff by treatment with sodium polysulphides, or reduced to leuco-indophenol (e.g., with sodium sulphide), and then converted into the dyestuff, which is separated from the melt by treatment with mineral acid or with air. Dyestuffs obtained as above dye unmordanted cotton greenish-blue shades, fast to acids and light.—T. F. B.

Anthracene Series; Manufacture of Colouring Matters of the — [Anthracene Dyestuffs]. J. Y. Johnson, London. From Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, Germany. Eng. Pat. 712, Jan. 11, 1901.

SEE U.S. Pat. 767,259 of 1904; this J., 1904, 1025.—T. F. B.

UNITED STATES PATENTS.

Indoxylic Compounds; Process of Making —. W. Bagghel and G. C. Schumann, Assignors to Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, Germany. U.S. Pat. 772,775, Oct. 18, 1904.

"INDOXYLIC compounds" are obtained by melting with alkali hydroxide hydroxyethylamino derivatives of aromatic hydrocarbons (e.g., hydroxyethylaniline) in presence of a dehydrating agent.—T. F. B.

Trioxanthraquinone Dye [Anthracene Dyestuff]. L. Wolman, Elberfeld, Germany, Assignor to Farbenfabr. of Elberfeld Co., New York. U.S. Pat. 772,857, Oct. 18, 1904.

SEE Fr. Pat. 342,195 of 1904; this J., 1904, 898.—T. F. B.

Sulphur Dye [Sulphide Dyestuff]; Yellow —, and Process of Making same. A. Schmidt and O. Rhodius, Assignors to Farbwerke vorm. Meister, Lucius and Brüning, Höchst-on-the-Maine, Germany. U.S. Pat. 773,346, Oct. 25, 1904.

SEE Eng. Pat. 21,945 of 1903; this J., 1904, 819.—T. F. B.

FRENCH PATENTS.

Yellow Monoazo Dyestuff; Manufacture of — from *o*-Amino-*p*-sulphobenzoic Acid and Phenylmethylpyrazolone. Cie. Parisienne de Couleurs d'Aniline. First Addition, dated July 23, 1903, to Fr. Pat. 338,531 of March 30, 1903.

ACCORDING to the original patent (this J., 1904, 657, and 1903, 862) a yellow dyestuff suitable for the preparation of lakes is obtained by diazotising *o*-aminobenzoic-*p*-sulphonic acid and combining the diazo compound with phenylmethylpyrazolone. According to the present addition the *o*-aminobenzoic-*p*-sulphonic acid is replaced by either *o*-toluidinesulphonic acid ($CH_3 : NH_2 : SO_3H = 1.2.4$) or its isomer ($CH_3 : NH_2 : SO_3H = 1.2.5$). The diazo compounds are combined with phenylmethylpyrazolone in alkaline solution. The dyestuffs form yellow powders soluble with difficulty in cold, but easily in hot water. The lakes obtained from them are redder in shade than those from the compound described in the original patent. They are said to be very fast to light.—E. F.

***p*-Acetylalkylamino-*o*-aminophenol-*o*-sulphonic Acid, and Monoazo Mordant Dyestuffs [Azo Dyestuffs] Derived therefrom; Preparation of —.** L. Cassella and Co. Fr. Pat. 338,980, Aug. 12, 1903.

ACETYLALKYL-*p*-PHENYLENEDIAMINE is diazotised and boiled, thus forming *p*-acetylalkylaminophenol. On sulphonation at 50°—60° C. with 100 per cent. sulphuric acid, this forms 1-phenol-4-acetylalkylamino-2-sulphonic acid, which is nitrated at 10°—15° C. by addition of nitrosulphuric acid to the sulphonation mixture, forming 6-nitro-1-phenol-4-acetylalkylamino-2-sulphonic acid. This is reduced to 6-amino-1-phenol-4-acetylalkylamino-2-sulphonic acid by means of sodium sulphide. This acid is converted by nitrous acid into a readily soluble yellow diazo compound which combines with amines and phenols, for instance, with resorcinol, β -naphthol, 1.5- and 2.3-dihydroxynaphthalene, 1.4-naphtholsulphonic acid, 1-naphthol-3.6-disulphonic acid, β -naphthol- β -sulphonic acid, 2.7-naphtholsulphonic

acid, β -naphtholdisulphonic acid R, 1.8-dihydroxynaphthalene-4-sulphonic acid, 1.8-dihydroxynaphthalene-3.6-disulphonic acid, *m*-phenylenediamine, *m*-toluylenediamine, 1.5-aminonaphthol, 2.8-aminonaphthol-6-sulphonic acid, 1.8.4-, 1.8.5-, 1.6.3-, and 1.7.3-aminonaphtholsulphonic acids, 2.3-aminonaphthol-6-sulphonic acid, 1.8-aminonaphthol-3.6-disulphonic acid, and 1.8-aminonaphthol-2.4-disulphonic acid, to form monoazo mordant dyestuffs, said to give bright, even shades of great fastness. The diazotised acetyethyl acid combines with β -naphthol to form a dyestuff which dyes wool in reddish-brown shades, turning to violet-black on after-treatment with bichromate. With 1.8-dihydroxynaphthalene-3.6-disulphonic acid it forms a dyestuff which gives violet shades on wool, turning to bright blue on after-treatment with bichromate.—E. F.

Tetrazophenol Sulphonic Acid, and an Azo Dyestuff Derived therefrom; Process for making a —. Farbwerke vorm. Meister, Lucius und Brüning. Fr. Pat. 339,004, Aug. 27, 1903.

SEE Eng. Pat. 18,283 of 1903; this J., 1904, 818.—T. F. B.

Orthohydroxyazo Dyestuffs Susceptible to Chroming on the Fibre; Production of —. Badische Anilin und Soda Fabrik. Second Addition, dated April 27, 1904, to Fr. Pat. 338,819, Dec. 17, 1903.

INSTEAD of using chlorine or hypochlorites for replacing the *o*-sulphonic group of 1.2- or 2.1-diazonaphthalene-sulphonic acids, or the sulphi- or chloro-derivatives of these, by a hydroxyl group, other oxidising agents may be employed, for example, hydrogen peroxide, alkali peroxides or persulphates, &c. (See this J., 1904, 820 and 1026.)

—T. F. B.

Dyestuff containing Sulphur [Sulphide Dyestuff]; Process for Producing a Deep Blue —. K. Oehler. Fr. Pat. 344,274, June 13, 1904.

SEE Eng. Pat. 12,270 of 1904; this J., 1904, 863.—T. F. B.

Lakes; Production of — [from Azo Dyestuffs]. Farbenfabr. vorm. F. Bayer et Cie. Fr. Pat. 344,395, June 28, 1904.

ORANGE to bluish-red lakes are obtained by precipitating on a suitable substratum, in the usual way, the azo dyestuffs produced by combining the diazo derivative of aniline-*o*-sulphonic acid or its homologues or derivatives with naphtholsulphonic acids. Yellowish-red lakes are produced by combining the diazo derivatives of aniline-*o*-sulphonic acid or of 1.2.4-anilinedisulphonic acid with 1.4-naphtholsulphonic acid. Orange lakes are obtained from aniline-*o*-sulphonic acid and 1.5-naphtholsulphonic acid or 2.6.8-naphtholdisulphonic acid. Red lakes result from combining the diazo derivative of monoacetyl-*p*-phenylenediaminemonosulphonic acid ($\text{NH}_2\text{CH}_2\text{CO.NH}:\text{SO}_3\text{H} = 1.4.6$) with 2.8-naphtholsulphonic acid, or of *p*-toluidine-*m*-sulphonic (1.4.6) with 1.4-naphtholsulphonic acid, whilst a bluish-red lake is obtained from the above-mentioned acetyl-*p*-phenylenediaminesulphonic acid and 1.3.8-naphtholdisulphonic acid.—T. F. B.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

Silk and Wool as Dyestuff Components. H. Pauly and A. Binz. Z. Farben- u. Textil-Chem., 1904, 3, 373—374.

AMONG the products into which albumin can be resolved, two compounds, namely, tyrosine, $\text{HO.C}_6\text{H}_4\text{CH}_2\text{CH}(\text{NH}_2).\text{COOH}$, and histidine, probably of the formula $(\text{C}_2\text{N}_2\text{H}_2)\text{CH}_2\text{CH}(\text{NH}_2).\text{COOH}$, are found, which are capable of combining with diazonium compounds. With diazobenzenesulphonic acid the first of these gives, in a solution rendered alkaline with sodium carbonate, a deep red, the second a bluish-red coloration. In acid solutions both yield yellowish-orange colorations. The compounds thus formed, dye wool from acid baths, but the baths are not exhausted. The compound derived from tyrosine

dyes wool in the same shade as this fibre is dyed by the diazo compound itself. No other albumin decomposition product as yet examined gives similar compounds. The above and similar dyestuff compounds may be obtained with tyrosine and histidine while these are in the combined state, in the form of albuminoids. Moreover, those albuminoids which on hydrolysis are resolved into tyrosine and histidine yield them, but, on the other hand, those, e.g., salmin, scombrin, and clupein, which, when so decomposed do not furnish tyrosine or histidine, do not give them. On hair, finger-nails, wool (keratin) and raw silk (fibroin and sericin), which, when decomposed, yield tyrosine but no histidine, the colorations produced by diazo compounds are hence, it would seem, formed through the intermediary of the tyrosine which these products contain. The colorations formed upon wool, in which 3—4.58 per cent. of tyrosine is present, are less intense than those produced upon silk, from which up to 10 per cent. of the base has been obtained. Those produced upon wool are, however, slightly deeper, when the fibre, before treatment with the diazo compounds, is boiled with 4 per cent. of its weight of sulphuric acid, diluted with water, as in the application of azo dyestuffs to it. Raw silk is coloured more highly than boiled-off silk. This may be due to the fact that more tyrosine is present in sericin than in fibroin, or it may be that the latter substance, in the process of boiling-off, loses some of the tyrosine present in it. When wool and silk are jointly oxidised (by bromine) with dimethyl-*p*-phenylenediamine, in a bath containing sodium acetate and acetic acid, the fibres are dyed grey, while the solution is coloured crimson. These colorations are not produced when the fibres and the diamine compound are oxidised separately. When a solution of tyrosine is used instead of the fibres, a compound of the same color as that of the dyed fibres is formed and precipitated. Similar colorations are obtained with 1.4-aminonaphthol. The colorations thus obtained resemble those produced upon hair and feathers by the oxidation upon them (by the air) of *p*-diamines and *p*-aminophenols (see Eng. Pat. 2525 of 1889; this J., 1890, 174), compounds of the same class being no doubt produced in each case.—E. B.

Dyeing; Theory of —. R. Willstätter. Ber., 1904, 37, 3758—3760.

THE author has investigated the action of racemic compounds on wool with a view of obtaining evidence as to whether the dyeing of animal fibres depends on chemical or physical changes. Assuming the dyeing to be occasioned by chemical reactions, i.e., by the formation of salts, it follows that the fibre, being optically active, would split up the racemic dyestuff. The author's experiments do not, however, support this contention. Decomposition does not occur; in each case racemic material was found in the bath and on the fibre. Owing to the want of suitable material the experiments were not performed with racemic dyestuffs, but with alkaloids, it having been proved that substances such as atropine, homatropine, and tropacocaine behave like basic dyestuffs towards animal fibres. From solutions of their salts the alkaloids are taken up as such by fibres, and in this respect they resemble the tannin dyestuffs. Excess of acid was found to retard the progress of absorption, whilst with an insufficient quantity of acid a larger proportion of alkaloid was taken up. Neither the alkaloid absorbed by the fibre nor that left in the bath had undergone any change in optical character.—D. B.

Acid Indigo Discharge Bath [Calico Printing]; Omission of Oxalic Acid from the —. Schaposchnikoff and Kadygrob. Z. Farben- u. Textil-Chem., 1904, 3, 374—377.

SCHAPOSCHNIKOFF and Michirew have already pointed out the possibility of dispensing, with considerable economy, with the use of oxalic acid in the acid bath employed in discharging indigo-dyed tissues printed with alkali chromates, and of using for this dilute sulphuric acid alone, the necessary oxalic acid being added to the potassium chromate printing mixture in the form of potassium oxalate. Prud'homme (this J., 1908, 359) has also made some experiments with the same object (see also this J., 1904, 932). In the

present series of experiments a cotton tissue dyed on the large scale a dark shade of indigo was used. The proportion of chromic acid required to discharge the indigo upon this was determined by dipping strips of it in solutions containing various proportions of potassium bichromate, squeezing, and immersing for 15 seconds, at a temperature of 65° C., in a bath containing 120 grms. of concentrated sulphuric acid and 60 grms. of crystallised oxalic acid per litre. The minimum proportion required was thus found to be that contained in a solution of 30 grms. of potassium bichromate (equivalent to 39.6 grms. of potassium chromate) per litre.

The Proportions of Chromic and Oxalic Acids which are most Effective in Discharging Indigo.—Strips of the dyed tissue were saturated with solutions containing various proportions of potassium chromate and oxalate, squeezed, and steeped for 15 seconds, at a temperature of 65° C., in a bath containing 120 grms. of concentrated sulphuric acid per litre. Complete discharges of the indigo were produced with the following mixtures:—(i) 1 mol. proportion (39.6 grms. per litre) of potassium chromate and 3½ mol. proportions (1 mol. prop. = 37.6 grms. per litre) of potassium oxalate; (ii) 1½ and 3; (iii) 2 and 2½; (iv) 2½ and 2; and (v) 3 mol. prop. of the first and 1½ mol. prop. of the second salt, the best results being, however, obtained with mixtures (ii) and (iii).

Influence of Temperature.—At a temperature of 65° C. 60 grms. of concentrated sulphuric acid per litre were required to produce a discharge. At 80° C. this proportion could be reduced to 50 grms., and at 100° C. to 30 grms. per litre, without detriment to the result.

Duration of the Action.—The action is complete in 15–20 seconds.

Influence of Thickening Agents upon the Reaction.—A portion of a solution containing per litre 112.8 grms. of potassium oxalate and 59.4 grms. of potassium chromate was thickened with British gum at the rate of 400 grms. per litre. It was then applied to the tissue by machine-padding, the tissue being dried and immersed in sulphuric acid. The effect of the gum on the reaction was found to be slight, the admixture of the proportion mentioned reducing the discharging action to the extent of about 5 per cent.

Printing Mixtures Recommended.—Proportions considered suitable for printing, for discharging with dilute sulphuric acid, are, for a white discharge upon dark indigo dyed tissues, 103 grms. of potassium oxalate and 87 grms. of potassium chromate, dissolved together in 250 grms. of hot water and thickened with 560 grms. of British gum (1:1); and for a yellow discharge, 500 grms. of lead chromate (75 per cent. paste), 210 grms. of blood-albumin solution (2:3), 170 grms. of gum-tragacanth paste (6:100), and 40 grms. of water, to which, after stirring well together, 60 grms. of potassium chromate and 50 grms. of potassium oxalate, both salts in a state of fine powder, are added.

—E. B.

Monobromo-Indigo in Dyeing and Printing. A. Sansone. Rev. Gén. Mat. Col., 1904, 8, 321–323.

THE shades obtained with monobromo-indigo are more beautiful and redder than those obtained with artificial indigo; they are also faster to rubbing and bleaching agents, but not so fast to light in pale shades. The ordinary sulphate of iron and lime or zinc and lime vats do not give good results with the monobromo-indigo. Hydrosulphite gives good results. The following is an example of the method of preparing the vat. Mix 500 grms. of monobromo-indigo with 1000 grms. of zinc powder and a little water, so as to make a paste, then add 2 litres of sodium bisulphite solution (30° B.), and 500 grms. of caustic soda in small pieces, allow to stand for one hour with occasional stirring, and then make up to 100 litres with water.

—A. B. S.

Silk Printed with a Fatty Reserve; Dyeing.—J. Haas. Oesterr. Wollen- u. Leinen-Ind., 1904, 24, 1135. Chem.-Zeit., 1904, 28, Rep. 313–314.

THE method of dyeing silk which has been printed with a fatty reserve gives small white effects on coloured grounds. The reserve is prepared by heating together for one hour 3 kilos. of colophony, 250 grms. of wax, 200 grms. of

spermaceti, 200 grms. of paraffin, and 200 grms. of talc, and then, after cooling somewhat, adding 1½ litres of turpentine. The "mastic" so obtained can be made thicker or thinner by reducing or increasing the amount of turpentine. During the printing the "mastic" is gently warmed, and the fabric is strewn with "Terre de Sommière," a white chalky earth. The reserve dries in the course of 2–3 days. The material is then passed through cold water acidulated with hydrochloric acid to remove the chalky earth, and is finally dyed in a cold bath acidulated with hydrochloric acid. Basic dyestuffs are used, except for black, which is produced by passing the material once or twice during 1–2 hours through an "iron bath of 5° strength," well washing, and dyeing for 1–2 hours in a cold bath of log-wood together with some fustic. For Navy blue, a mixture of Malachite Green and Diamond Fuchsin is used, and for reds, mixtures of Safranin, Rhodamine 6 G, Grenadine, Auramine, and Phosphine. After dyeing, the material is washed, wrung out, dried, and the reserve removed by treatment with petroleum benzine for 20–30 minutes in a suitable apparatus.—A. S.

Fabrics for Binding; Finishing of.—O. Piqueur. Rev. Gén. Mat. Col., 1904, 8, 328–340.

Colouring.—Calico for coloured bindings is either dyed (common colours) or printed (extra colours). It is very important for the colours to be fast to rubbing and also to light. They must also be fast to glue. For the dyed colours the material is usually mordanted with tannin, and fixed with tartar emetic or an iron salt, according as a light or dark shade is needed; it is then dyed with a suitable basic dyestuff. After dyeing, the material is frequently brought to the required shade by means of a coloured finish. In some cases the cotton is dyed with acid dyestuffs from a concentrated salt bath. For printed colours, alumina lakes are usually employed, thickened with starch. The mineral colours, such as Prussian Blue, Chrome Yellow, Ultramarine, &c., are also used, as well as Aniline Black. The pieces are passed through the printing rollers (which are engraved with fine lines or dots) from four to six times, being moistened between each passage.

Finishing.—If the material is sufficiently coloured it is finished with a white finish containing 36 kilos. of white starch, 1½ kilos. of gelatin, and 3 kilos. of tallow or lard per 200 litres. The dyed cloth is usually finished with a coloured finish, which contains, besides the starch flour and gelatin, the requisite dyestuffs, together with a tannin material if basic dyestuffs be used, or alum if acid dyestuffs be employed. The finish is applied to the cloth on one side, two or more times, as necessary, and is always used hot. The pieces are then thoroughly moistened and left rolled up over night in readiness for the next process.

Calendering.—The moistened pieces are then passed between heated steel friction rollers, which smooth the surface and do away with any irregularities in the material.

Embossing.—The pieces which are required to have a raised pattern are then passed, still in a slightly moist state, between two rollers, one of which is made of copper or steel and is engraved with the required design, whilst the other is made of paper or compressed cotton.—A. B. S.

ENGLISH PATENTS.

Alkaline Chlorides and Oxychlorides; Preserving the Strength and Keeping Powers of Solutions of — employed for Bleaching, Disinfecting, Separation of Metals, and other such like purposes. G. J. Atkins, and Oxychlorides, Ltd. Eng. Pat. 25,972, Nov. 27, 1903. VII., page 1088.

Yarns and Fabrics; Dyeing of.—A. R. Donisthorpe, G. White, and G. E. Ellis, Leicester. Eng. Pat. 25,400, Nov. 21, 1903.

THE yarn is dyed in the hank, parts of the hank being in turn immersed in dye-baths of different colours, so that the dyed yarn has definite lengths dyed with different colours. On weaving, the various colours show up in the cloth as if the latter had been woven with different-coloured yarns.

—A. B. S.

Multi-coloured Dyeing of Yarns, &c. A. R. Donisthorpe and G. White, Leicester. Eng. Pat. 25,611, Nov. 24, 1903.

THE wool rovings are reeled into hanks, and the latter are then dyed in several colours by immersing only part of the hanks into each colour, so as to get various colours on the same hank. The parti-coloured rovings are then spun, either alone or with other rovings, so that the yarn obtained shows mixed effects.—A. B. S.

Dyeing Hanks of Yarn. L. Destrée and A. Wiescher, Haren-les-Vilvorde, Belgium. Eng. Pat. 17,340, Aug. 6, 1904.

SEVERAL hanks of yarn are spread out side by side, in the form of skeins, upon two sticks, placed parallel to each other, and provided with devices to prevent lateral slipping. The sticks are then fastened by means of hooks or clips, externally to the skeins, each to a stick belonging to another pair of sticks, upon which hanks are similarly spread, this being repeated with the sticks at the ends, until the chain produced is long enough for conveyance by means of rollers through a dye-bath. The hanks are then dyed in the same manner as tissues.—E. B.

Printing of Textile Fabrics; Machine for —. Sir W. Mather, Manchester. Eng. Pat. 21,595, Oct. 7, 1903.

IN a printing machine with several rollers, some of which are only needed to print at intervals, as in the cross borders of scarves, automatically adjustable cams are arranged so as to hold either set of rollers out of printing contact during the whole or a fractional part of the revolution of the main printing bowl.—A. B. S.

Dressing of Yarns and like Material. F. W. Howorth, London. From Soc. Franç. de la Viscose, Paris. Eng. Pat. 24,637, Nov. 12, 1903.

SEE Fr. Pat. 335,598 of 1903; this J., 1904, 251.—T. F. B.

Coating Fabrics; Machine for —. The Velvrl Co., Ltd., London, and J. S. R. Howkins, Thornton Heath. Eng. Pat. 27,202, Dec. 11, 1903.

THE cloth passes over a roller, and the desired waterproofing or other material is spread over it by means of a small roller which is in contact with the cloth, and is driven at a different speed from the large roller. The smaller roller is pressed in contact with the cloth by means of adjustable weights or springs, and the distance between the faces of the two rollers can be regulated according to the amount of material it is required to impregnate the cloth with.

—A. B. S.

Finishing Piece Goods. P. Kraus, Ilkley, and The Bradford Dyers' Association, Ltd., Bradford. Eng. Pat. 17,242, Aug. 6, 1904.

TO preserve the Schreiner finish, which is produced upon tissues by passing them between rollers engraved with fine parallel lines, tissues are treated, e.g. sprayed, with a 5 per cent. solution of nitrocellulose in amyl acetate, and are then passed over hot cylinders, these operations being repeated. The lustre produced in the finishing process on the tissues thus treated resists, it is stated, the influences of steam and moisture.—E. B.

UNITED STATES PATENTS.

Viscose; Apparatus for Treating [Firing Skeins of] —. L. Naudin, Assignor to Soc. Franç. de la Viscose, Paris. U.S. Pat. 773,412, Oct. 25, 1904.

SEE Fr. Pat. 340,812 of 1904; this J., 1904, 821.—T. F. B.

Dyeing under Pressure; Apparatus for —. L. Détré, Reims, France. U.S. Pat. 773,378, Oct. 25, 1904.

SEE Fr. Pat. 329,896 of 1903; this J., 1903, 1044.—T. F. B.

FRENCH PATENTS.

Copper Solutions; Alkaline — which can Produce Concentrated Solutions of Cellulose easily made into Threads, and which improve the Appearance and Texture of Cotton Threads and Fabrics. M. Prud'homme. Fr. Pat. 344,138, June 18, 1904.

AMMONIACAL copper solutions to which alkali hydroxide has been added, are found to possess considerable solvent power for cellulose, giving solutions very suitable for pressing into threads. Cotton, when treated in such a solution, swells up, and assumes the appearance of parchment. After washing in dilute acid and drying, the fabric is found not to have shrunk, whilst the appearance and texture of the cotton are said to be improved by such treatment.

—T. F. B.

Textile Fabrics; Method for rendering — Waterproof. F. Sauerland. Fr. Pat. 343,977, June 14, 1904.

THE fabric, after being mordanted in the usual manner and coated with some water-resisting substance, is treated for a short time with a weak boiling solution of rosin soap. The following method also gives good results:—Mordant the goods for one hour with a liquor of 3° B. strength containing 100 parts of alum, 160 parts of calcium carbonate, 100 parts of sulphate of alumina (free from iron), 15 parts of oxide of zinc, and 150 parts of acetate of lead. Now coat each side of the material with a layer composed of 60 parts of paraffin, 20 parts of Japan wax, 17½ parts of stearine, and 2½ parts of a 10 per cent. solution of Para rubber. The right side is further treated with a solution of some sticky substance, such as Para rubber. This treatment is advantageously performed in a specially designed machine, consisting of a series of rollers, between which the fabric passes, whence it is conducted through heated troughs containing the solutions.—F. D. T.

VII.—ACIDS, ALKALIS, AND SALTS.

Electrolysis of Potassium Chloride and Sodium Chloride; Differences in —. F. Winteler. Electrochem. Ind., 1904, 2, 391—392.

COMMON salt is generally much less pure than commercial potassium chloride is, and the impurities cause trouble in the diaphragm process of alkali production. The fact that the temperature coefficients of the solubility of sodium and potassium chloride are so different further gives rise to a difference in the methods for obtaining caustic soda or caustic potash by evaporation; with the caustic soda evaporation to 50° B. removes all the sodium chloride except 1 per cent., whereas with the potassium salts several per cent. of chloride remain dissolved at the high temperature. In the production of chlorates, the low solubility of the potassium chlorate is undoubtedly an advantage, especially where chromates are added to the electrolyte to increase the efficiency of the process. The potassium chlorate crystallises out, and is thus separated from the chloride, whereas to obtain sodium chlorate it is first necessary to crystallise out the greater part of the sodium chloride.—R. S. H.

Litharge and Sodium Nitrite; Manufacture of —. M. Liebig. Z. angew. Chem., 1904, 17, 1673—1674.

THE sodium nitrate in the melting-pot is kept at the melting point of lead. The lead is cast in thin plates, and added to the melted nitrate till in slight excess. After all the lead has been added, the temperature is kept up for about 20 minutes, till the yellow mass turns brown. The litharge produced is tested for metallic lead, the nitrite for its content of pure nitrite. Litharge for accumulators must be free from metallic lead, and must not contain more than 0.006 per cent. of chlorine. Hence the extraction of the nitrite (when the litharge is prepared by the action of metallic lead on nitre) must be done with distilled water.

—J. T. D.

Magnesium Peroxide; So-called —. O. Raff and E. Geisel. Ber., 1904, 37, 3653—3688.

By adding 20 grms. of 30 per cent. hydrogen peroxide to a solution of 10 grms. of crystallised magnesium sulphate in 200 c.c. of water, and treating the liquid with 500 c.c. of 2N-alkali, a slimy precipitate was obtained, which in the moist condition yielded 1 atom of peroxide oxygen for each mol. of magnesium oxide. On drying the precipitate, oxygen was lost, the partially dry compound having the composition $\text{MgO} \cdot \text{MgO}_2 \cdot \text{aq}$. This product gradually lost more oxygen, until a compound of practically constant composition was left, containing 0.39 atom of peroxide oxygen per mol. of magnesium oxide, corresponding to the formula, $\text{MgO}_2 \cdot 3\text{MgO} \cdot \text{aq}$. In presence of water, the product rapidly lost oxygen, the peroxide in part dissolving and in part being decomposed according to the equations: $\text{Mg}(\text{OH})_2 = \text{Mg}(\text{OH})_2 + \text{H}_2\text{O}_2$; and $\text{Mg}(\text{OH})_2 + \text{H}_2\text{O}_2 = \text{Mg}(\text{OH})_2 + 2\text{H}_2\text{O} + \text{O}_2$.—A. S.

Salts in other than Aqueous Solutions; Reactions of —. A. Naumann. Ber., 1904, 37, 3600—3605.

THE following substances are soluble in dehydrated ethyl acetate: stannic chloride, cupric chloride, mercuric chloride, bromide and iodide, potassio-mercuric iodide, platinum chloride, cadmium chloride, iodide and nitrate, iodine, uranium bromide and iodide, potassio-cadmium iodide, antimony trichloride, oxalic acid, sulphur, potassium permanganate, lithium chloride, nitrate, fluoride, and bromide, palladium chloride, ferric chloride, zinc chloride, uranium nitrate and chloride, cobalt chloride and nitrate, magnesium chloride, potassium iodide. The following are insoluble: Cuprous chloride, silver nitrate, sulphate, chloride, and carbonate, lithium carbonate, sulphate, borate, metaborate, hydroxide, silicate and silico-fluoride, ferrous chloride and sulphate, zinc sulphate, arsenic trioxide, lead acetate, cadmium oxide, carbonate, bromide and sulphate, calcium chloride, sulphide, sulphite, oxide, carbonate, and hydroxide, potassium chromate, bichromate, bromide, chloride, cyanide, ferrocyanide, ferricyanide, chlorate, bromate, nitrate, sulphate, nitrite, sulphide, pyroantimonate, acid tartrate, oxalate, carbonate, arsenite, arsenate, hydroxide and thiocyanate, sodium chloride, acid sulphite, carbonate, hydroxide, and arsenite, borax, ammonium chloride, sulphate, carbonate, and oxalate, barium chloride, nitrate, carbonate and sulphate, strontium carbonate, magnesium oxide, carbonate and sulphate, cobalt sulphate, potassium cobaltinitrite, nickel sulphate, manganese sulphate, uranium sulphate, uranium acetate, mercuric chloride.

Mercuric Chloride.—A solution saturated at 18° C. contains 1 grm. of salt in 3.5 grms. of solvent, and has a sp. gr. of 1.11. It is completely precipitated by an ethyl acetate solution of stannous chloride, the mercury being converted into calomel. Dry hydrogen sulphide gas passed through the solution gives a yellow precipitate of $\text{HgCl}_2 \cdot 2\text{HgS}$. Ammonia gas precipitates the whole of the mercury as $\text{HgCl}_2 \cdot 2\text{NH}_3$. Cadmium iodide reacts with it, and forms a precipitate of cadmium chloride.

Cupric Chloride.—1 grm. of salt dissolves in 249 grms. of solvent sp. gr. of solution, 0.9055. Ammonia gas gives a bluish-green precipitate of $\text{CuCl}_2 \cdot 6\text{NH}_3$. Hydrogen sulphide precipitates the copper completely as CuS . Hydrochloric acid gas precipitates $\text{CuCl}_2 \cdot 2\text{HCl}$. Stannous chloride precipitates cuprous chloride. Cadmium iodide precipitates cuprous iodide, free iodine remaining in solution.—J. T. D.

Sulphuric Acid in Commercial Acetic Acid; Determination of Free —. C. Rossi. XXIII, page 1113.

Nitric Acid; Electrolytic Determination of — with a Rotating Anode. L. H. Ingham. XXIII, page 1114.

Nitrogen [Nitric Acid] from the Air; Electrical Extraction of —. J. S. Edstrom. XI. A., page 1096.

Boric Acid; Detection of —. L. Robin. XXIII, page 1113.

Lime; Determination of — in presence of Phosphoric Acid. K. K. Järvinen. XXIII, page 1114.

Bauxite; Analysis of —. Taurel. XXIII, page 1114.

Lead Compounds; Raw Materials for the Preparation of —. M. Liebig. XIII. A., page 1102.

ENGLISH PATENTS.

Sulphuric Acid; Manufacture of [Chamber Process] —. H. H. Lake, London. From the Firm of Società Anonima Ing. L. Vogel per la Fabbricazione di Concimi Chimici, Milan, Italy. Eng. Pat. 6846, March 21, 1904.

A PAIR of iron cylinders is set in the dust-collecting chamber of a pyrites kiln, to be heated by the effluent gases, such cylinders communicating with a series of Gay-Lussac towers. One of the cylinders is charged with sulphuric acid, to which, from time to time, as the acid is heated, portions of sodium nitrate are added. When the charge in one cylinder is exhausted, the second cylinder is similarly charged. The nitrous acid contained in the Gay-Lussac towers, strengthened by the nitric compounds obtained as described, is conducted back to the Glover tower, where it encounters the gases from the pyrites kiln, whereupon the circulation takes place through the lead chambers, and thence, through the Gay-Lussac towers, to the stack.—E. S.

Alkaline Chlorides [Alkali Chlorides] and Oxychlorides; Preserving the Strength and Keeping Powers of Solutions of —, employed for Bleaching, Disinfecting, Separation of Metals, and other such-like Purposes. G. J. Atkins, Tottenham, and Oxychlorides, Ltd., London. Eng. Pat. 25,972, Nov. 27, 1903.

It is claimed that the strength and keeping powers of solutions of alkali chlorides and oxychlorides employed for bleaching, disinfecting, separation of metals from their ores, and other purposes, are preserved by the addition of an alkaline salt, such as carbonate or hydroxide of sodium or potassium, calcium oxide, or borax.—E. S.

Ammonia Stills; Construction of —. G. E. Davis, Knutsford, Cheshire. Eng. Pat. 26,996, Dec. 9, 1903.

IN ammonia stills constructed with serrated caps (see Eng. Pat. 16,349 of 1888; this J., 1889, 834), in which fixed ammonia is set free by lime, such caps are, according to the present invention, fixed to the plates forming the tops of the chambers in which they rest, so that the serrations hang free in the liquid, admitting a small rake to be inserted underneath the caps for withdrawal of the deposit. Several methods for fixing such serrated caps are described and illustrated.—E. S.

Aluminium Compounds and By-products; Methods of Making —. L. R. Keogh and B. Broughton, Hamilton, Canada. Eng. Pat. 2655, Feb. 3, 1904.

SEE U.S. Pat. 744,765 of 1903; this J., 1903, 1347.—T. F. B.

Alumina; Manufacture of —. Cie. des Prod. Chim. D'Alais et de la Camargue, Salindres, France. Eng. Pat. 19,924, Sept. 15, 1904. Under Internat. Conv., Sept. 19, 1903.

SODIUM aluminate solution is heated under pressure of, say, 6 kilos. per sq. cm., in a closed vessel for some hours, with agitation, whereby a precipitate containing most of the silica present is stated to be formed. The pressure required may be obtained by passing into the containing vessel high-pressure steam, in such manner as to cause agitation, a small orifice being provided for escape of a little of the steam. Alumina, suitable for application in the manufacture of aluminium, may be prepared from the filtered aluminat solution thus obtained.—E. S.

UNITED STATES PATENTS.

Lime; Machine for Hydrating —. J. Reaney, jun., Sherwood, Md. U.S. Pat. 773,029, Oct. 25, 1904.

WITHIN a rotating inclined cylinder is secured centrally a perforated screen, tapering towards the discharge end, and having an imperforate extension at the charging end, at

which the lime to be hydrated is received from a shoot. Water is conducted from an elevated tank by a pipe which discharges automatically within the screen, when the gate to the shoot is opened. A perforated pipe connected to a boiler traverses the length of the screen centrally to maintain a discharge of steam within it. Between the outer cylinder and the inner perforated screen is an intermediate impermeforate screen, tapering to a lesser degree than the perforated one. There is a number of discharge openings, one registering with the shorter outer cylinder or jacket; and the other arranged to receive the overflow of the longer inner screen.—E. S.

Quicklime; Process of Converting — into Powdered Hydrated Lime. J. Reaney, jun., Sherwood, Md. U.S. Pat. 773,030, Oct. 25, 1904.

A WEIGHED portion of quicklime is subjected, in an apparatus such as that described in the preceding abstract, to tumbling with simultaneous wetting with a predetermined quantity of water, and to slow sifting, the hydrated fine particles being then rapidly moved to a point of discharge, whilst the non-hydrated particles remain for further hydration by the action of steam.—E. S.

Alkali Salts; Making and Separating — from Insoluble Combinations. H. S. Blackmore, Mount Vernon, N.Y. U.S. Pat. 772,206, Oct. 11, 1904.

SOLUBLE alkali salts are obtained from their insoluble combinations by subjecting the latter to the action of water and of a "gas" (such as carbon dioxide), under varying pressure, above and below that of the atmosphere. Lithium carbonate is obtained from insoluble lithium compounds by exposing them to the action of water and carbon dioxide, under pressure. A continuous process of making soluble alkali carbonates from insoluble combinations, consists in mixing the latter with water, withdrawing air by subjecting the mixture to reduced pressure, then admitting carbon dioxide under increased pressure, and diminishing and increasing the pressure at intervals. The soluble salt separated is then withdrawn, and the process is continued after renewing the materials.—E. S.

Refractory Silicates; Method of Decomposing —. W. T. Gibbs, Buckingham, Canada. U.S. Pat. 772,612, Oct. 18, 1904.

THE method consists in treating the silicate with a decomposing solution containing a catalytic agent and a reagent that will combine with the base or bases and leave the catalytic agent free for further action. The decomposing solution contains a small proportion of hydrofluosilicic acid and a large proportion of sulphuric acid.—W. C. H.

Refractory Silicates; Process of Decomposing —. W. T. Gibbs, Buckingham, Canada. U.S. Pat. 772,657, Oct. 18, 1904.

THE silicates are reduced to a finely-divided condition and treated with an amount of hydrofluosilicic acid, which is in excess of that required to combine with the bases of the silicates; the silico-fluorides of the bases are subsequently treated to recover the hydrofluosilicic acid.—W. C. H.

Salt; Process of Making Pure —. O. Sachse, Assignor to the firm of Triplex, Ges. f. Soole-Verdampfung im Vacuum M.B.H., Lüneburg, Germany. U.S. Pat. 773,343, Oct. 25, 1904.

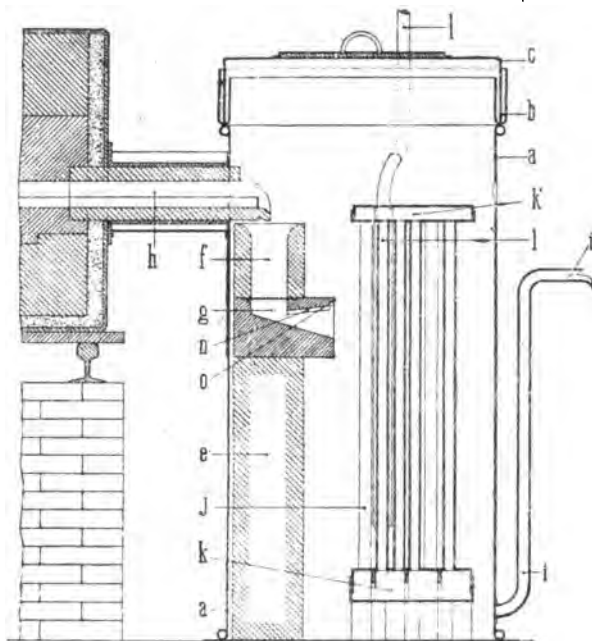
BRINE containing salts of calcium and magnesium is treated with sodium carbonate, slightly in excess of the proportion necessary to precipitate the calcium as carbonate. The liquid, cleared from the precipitate, is concentrated in a vacuum to separate the salt; and the mother-liquor, rich in magnesium sulphate, is added to another portion of untreated brine.—E. S.

Electrically Treating Gases [Air]; Process of —. K. Birkeland. U.S. Pat. 772,862, Oct. 18, 1904. XI. A., page 1097.

FRENCH PATENTS.

Sulphuric Acid; Apparatus for the Concentration of — in contact with Heated Gases. J. L. Kessler. First Addition, dated June 20, 1904, to Fr. Pat. 283,752 of Dec. 6, 1898. (See Eng. Pat. 25,169 of Dec. 10, 1898; this J., 1900, 246.)

THIS apparatus is intended to effect the rapid cooling of the concentrated acid down to the point at which it does not materially attack lead, while simultaneously heating chamber acid, or acid for concentration, admitted into a series of vertical lead pipes set in the cooler. Referring to the drawing, the hot concentrated acid is admitted in contact



with heated gases (or otherwise, if desired, under the present addition) into the lead cylinder *a*, through the channel *h*, into the short cylindrical stone receptacle *f*, whence it flows until the cylinder is charged nearly up to the level of the piece *f*, the height being determined mainly by the passage of the cooled acid from the exit tube *i*. The dilute acid enters the tubular lead system through the jacketed pipe *l*, and has passage, after being heated by the surrounding hot concentrated acid, to the concentrator through an exit pipe not shown. The stream of concentrated acid entering *f*, when the apparatus is charged, is deflected upwards through grooves formed in the outlet *n*, *o*, and, owing to its less specific gravity than the cooler liquid of the mass, rises to the surface, carrying with it other layers of the acid, where it is cooled. Compare Eng. Pat. 21,376 of 1900; this J., 1901, 807.—E. S.

Sulphuric Acid; Apparatus for Concentrating —. J. L. Kessler. First Addition, dated June 20, 1904, to Fr. Pat. 305,781 of Nov. 28, 1900. (See Eng. Pat. 21,376 of Nov. 26, 1900; this J., 1901, 807.)

THE arrangements, &c. claimed in the addition to Fr. Pat. 283,752 (see preceding abstract) are claimed also in the present addition.—E. S.

Carbonic Acid; Manufacture of —. E. A. and J. G. Behrens. Fr. Pat. 343,903, June 11, 1904.

THE products of the combustion of water-gas or of generator-gas are compressed, and passed, still under pressure, into a solution of potassium carbonate, maintained at the temperature of decomposition of hydrogen-potassium carbonate. The unabsorbed nitrogen is allowed to escape, and the hot carbonated solution is conducted away, and as

soon as it ceases to be under more than atmospheric pressure, the carbon dioxide absorbed is set free, and is collected for liquefaction.—E. S.

Alumina and Alkalis; Extraction of — from Alkaline Silicates of Alumina, such as Leucite. G. Levi. Fr. Pat. 344,296, June 25, 1904.

LEUCITE, or other similar mineral, is treated with a strong solution of an alkali or alkaline earth hydroxide in an autoclave at a pressure exceeding six atmospheres (preferably at about 16 atmospheres) with agitation. Alumina, iron oxide, &c., remain undissolved, and are separated by filtration, whilst from the solution, containing an alkali or alkaline earth silicate, the alkali is recovered by known means. The aluminous residue is mixed with a concentrated alkaline solution to a pasty mass, to which lime is added, and the mass is heated. An alkali aluminate is dissolved out of the product, from which alumina is obtained, as, for instance, by injection of carbon dioxide.

—E. S.

Alumina; Preparation of — by an Electro-metallurgical Process. Soc. Anon. Electro-Metallurgique, Procédés P. Girod. Fr. Pat. 344,549, July 4, 1904. XI. B., page 1098.

Sulphates; Reduction of Alkaline-Earth and Alkali — to Sulphides, and of Metallic Oxides to Metals. C. Castiglioni and L. Calastretti. Fr. Pat. 343,926, June 13, 1904. Under Internat. Conv., June 20, 1903.

THE substance to be reduced is contained in a receptacle heated externally, and is subjected to the action of a reducing vapour or gas obtained by the dry distillation of organic matter, by the decomposition of steam by charcoal heated to incandescence, or by the action of water on alkaline-earth carbides.—A. S.

Nickel Ores; Treatment of —, and Apparatus therefor. G. H. Gin. Fr. Pat. 344,203, June 22, 1904.

NICKEL oxide, or an ore of the oxide, is subjected to the action of sulphuric acid of about 53° B., at a temperature of about 155° C., involving a pressure of 4 kilos. to the sq. cm. The apparatus consists of a pair of lead-lined autoclaves heated by a single furnace, and operated alternately. The solution obtained is cooled by a current of cold air, and by addition of a cold saturated solution of nickel sulphate containing basic nickel sulphate in suspension. The filtered liquid is crystallised.—E. S.

VIII.—GLASS, POTTERY, ENAMELS.

ENGLISH PATENT.

Vitreous Cement [for Porcelain, &c.]; Manufacture of —. P. Steenbock, Deutsch-Wilmersdorf, Germany. Eng. Pat. 15,176, July 7, 1904.

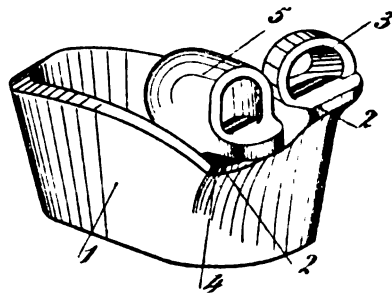
A solution of basic beryllium nitrate is precipitated with sodium silicate, and the precipitate washed, dried, and slightly calcined. This product is finely ground and may be used by itself or mixed with glass or pure clay. The cement is made by triturating the powder or mixed powders with a solution of orthophosphoric acid almost saturated with aluminium phosphate, with the addition of a little zinc phosphate. See also Eng. Pat. 15,181, July 7, 1904; J., 1904, 901.—W. C. H.

FRENCH PATENTS.

Crucible for Glass for Continuous Working. F. Lang. Fr. Pat. 343,309, May 19, 1904.

THE crucible shown allows of constant working, the glass in it being kept at a constant level, and withdrawn by a ladle without cooling the molten mass. It consists essentially of the crucible proper (1), which is placed in the furnace opposite one of the openings. The crucible is provided with a mouth (3) in the shape of an arch, through which the cold materials are fed, and with a vessel (5) cemented on to the wall of the crucible. The front

of this vessel is also in the shape of an arch and serves for the introduction of the ladle; the other end of the vessel reaches nearly to the bottom of the crucible, tapering off to an open pipe, through which the molten glass enters



from below as fast as it is removed from above by the ladle. In case of damage this vessel can be replaced without interrupting the fusion. For making crystal glass the crucible may be provided with a dome-shaped cover, so as to prevent the flame from coming in contact with the glass.

—A. G. L.

Quartz Glass; Manufacture of —. J. Bredel. Fr. Pat. 344,169, June 21, 1904.

THE quartz is fused and run by means of a heated channel into a heated mould, preferably placed below the furnace. Both channel and mould are previously evacuated, to prevent the quartz from being chilled during its flow.

—A. G. L.

Quartz Glass; Manufacture of Objects of —. J. Bredel. Fr. Pat. 344,170, June 21, 1904.

THE material is first repeatedly subjected to a cooling process, and is then fused. While still fluid it is treated with a jet of cold air or vapour which transforms it into silica wool; this is then moulded into the required shape and afterwards fused.—A. G. L.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

Cement; Specifications for —, submitted to the American Society for Testing Materials. Engin. News, 1904, 51, 619—620. Science Abstracts, 1904, 7, B, 860—861.

THE Cement Committee of the American Society for Testing Materials recommend that the acceptance or rejection of samples of cement be based upon the following requirements, the tests being made in accordance with the methods proposed by the Committee on Uniform Tests of Cement of the American Society of Civil Engineers:—

NATURAL CEMENT.—Definition: The finely-pulverised product obtained by the calcination of an argillaceous limestone at a temperature only sufficient to expel the carbon dioxide. **Specific Gravity:** The material dried at 100° C. should have a specific gravity not less than 2.8. **Fineness:** Residue on a No. 100 sieve, not more than 10 per cent.; and on a No. 200 sieve, not more than 30 per cent. **Time of Setting:** Initial set in not less than 10 mins., and hard set in not less than 30 mins. nor more than 3 hours.

PORTLAND CEMENT.—Definition: The finely-pulverised product obtained by the calcination to incipient fusion of an intimate mixture of argillaceous and calcareous materials in proper proportions, and to which no addition greater than 3 per cent. has been made subsequent to calcination. **Specific Gravity:** The material dried at 100° C. should have a specific gravity not less than 3.1. **Fineness:** Residue on a No. 100 sieve, not more than 8 per cent.; and on a No. 200 sieve, not more than 25 per cent. **Time of Setting:** Initial set in not less than 30 mins., hard set in not less than 1 hour nor more than 10 hours. **Tensile Strength:** Briquettes, 1 in. square in section should give the

following results, and should suffer no retrogression in strength within the periods specified:—

	Strength after :		
	24 Hours in Moist Air.	7 Days, 1 in Air and 6 in Water.	28 Days, 1 in Moist Air and 27 in Water.
	Lb.	Lb.	Lb.
Natural cement, neat.....	50—100	100—120	200—300
Portland cement, neat.....	150—200	450—550	550—650
1 of natural cement and 3 of sand.	..	25—75	75—150
1 of Portland cement and 3 of sand	..	150—200	200—300

Constancy of Volume.—Pats of neat cement about 3 ins. diameter, $\frac{1}{2}$ in. thick at the centre, and tapering to a thin edge, shall be kept in moist air for 24 hours. (a) A pat is then kept in air at the ordinary temperature and examined at intervals during at least 28 days. (b) Another pat is kept in water maintained at 70° F., and examined at intervals during at least 28 days. (c) (For Portland cement only.) A third pat is exposed in an atmosphere of steam above boiling water, in a loosely-closed vessel for 5 hours. In all three tests the pats should remain firm and hard, and show no signs of distortion, "checking," cracking, or disintegration.

Content of Sulphuric Acid and Magnesia.—The cement shall not contain more than 1.75 per cent. of sulphuric anhydride, nor more than 4 per cent. of magnesia.—A. S.

Cement; Notes on the Boiling Test for — F. H. Lewis. Eng. Record, 1904, 50, 33—34. Science Abstracts, 1904, 7, B, 865.

THE author finds that the higher the silica and iron oxide, and within certain limits, the higher the sulphuric acid and lime, the better the results given by a cement when subjected to the boiling test. Magnesia appears to have no influence, but alumina should only be present in small quantity. He suggests as a cement suitable for passing the boiling test, one having the composition: lime, 66; silica, 25; iron oxide, 7; sulphuric anhydride, 2 per cent.—A. S.

ENGLISH PATENTS.

Wood; Method for Preserving — C. F. Reichel, Gröna, Germany. Eng. Pat. 21,578, Oct. 7, 1903.

SEE Fr. Pat. 335,781 of 1903; this J., 1904, 254.—T. F. B.

Paving Blocks from Towns' Refuse. W. Weaver, London. Eng. Pat. 22,042, Oct. 3, 1903.

THE clinker formed in "destructors" from towns' refuse is crushed, and about 80 parts are mixed with 15 parts of asphalt, and 5 parts of fine lime-stone or other dust, and consolidated into paving blocks under pressure.—W. C. H.

Cement or Moulded Articles; Apparatus and Process for utilising Gas Lime, or other Calcium Compounds and Clinker, Slag, or other Silicious or Aluminous Material for the Manufacture of — J. Bond, Leeds. Eng. Pat. 23,213, Oct. 27, 1903.

THE materials named in the title, after being mixed and ground, are fed into the top of an upright kiln or tower having a number of horizontal inverted U-shaped flues, open at the ends and bottom, and fixed alternately in sets throughout the whole height of the kiln. Spaces are left between the flues to allow the material to fall around and on their outer surface. The U-shaped flues are connected with vertical flues so as to allow the hot gases from a furnace to travel through the sets in a zigzag course. The material that has passed through the kiln is mixed, ground with clinker, and moulded, and the bricks or slabs are subjected to the action of steam and carbon dioxide under pressure.

—E. S.

UNITED STATES PATENTS.

Carborundum Article; Self-bonded — F. J. Tone, Niagara Falls, N.Y. U.S. Pat. 772,262, Oct. 11, 1904.

A REFRACTORY coherent article, or a refractory coherent facing for less refractory articles, is composed of super-ficially-oxidised particles of amorphous or crystalline carborundum, which are bound together by the oxidation and subsequent cohesion of the particles.—W. C. H.

Lime or Cement Kiln. W. S. Speed, Louisville, Ky. U.S. Pat. 772,184, Oct. 11, 1904.

THE kiln is vertical, and has a discharge opening at the bottom. Below this opening is a grid-like feeder with projections on its upper surface, that is worked backwards and forwards continuously by means of a shaft and crank arm. The forward movement of the feeder carries forward the lime deposited on it from the discharge opening of the kiln, and the backward movement causes this lime to fall off the front of the feeder, means being provided to prevent lime falling off the back end.—W. C. H.

Lithographic Stones; Substitute for —, and Method of Making same. G. Bower, St. Neots, and T. W. Gauntlett, London. U.S. Pat. 773,363, Oct. 25, 1904.

SEE Eng. Pat. 6155 of 1903; this J., 1904, 325.—T. F. B.

FRENCH PATENTS.

Wood; Treatment of — by the Injection of Antiseptic Substances by passing it through Vaporisation and Absorption Baths in various Receptacles. Conti-Vecchi. Fr. Pat. 344,204, June 22, 1904.

THE wood to be treated is placed in one of a number of vessels connected with each other and is given a preliminary heating by means of the steam disengaged in the next vessel. Hot water from this vessel is then run into the first, the water being maintained at the boiling-point by circulating it through a suitable heater. The hot water is then run into the next vessel of the series, and its place taken by a cold antiseptic liquid, which is kept cool by circulating it through a cooler. This operation may take place under ordinary or increased pressure. The entry of the cold liquid into the wood is exceedingly rapid as the pores of the latter have been opened and filled with steam in the preceding operation, the steam condensing on contact with the cold liquid. If it is desired to treat the wood with two distinct preservatives, e.g., creosote and a saline solution, one may be run into the bath after the other, or the two liquids may be emulsified and applied together. In the last case a suitable agitator must be placed in the vessel to maintain the emulsion. The cold liquid is then run into the next vessel and the wood removed, after which the same cycle of operations is repeated.—A. G. L.

Fire-Bricks and other Clay Objects; Continuous Furnace for Burning — D. F. Henry, jun. Fr. Pat. 344,332, June 27, 1904.

THE interior of the furnace is divided by a number of vertical partitions, reaching alternately to the top and to the bottom of the furnace, into vertical compartments. The hot gases are consequently forced to pass through these compartments in a zigzag course, and in so doing meet and impart their heat to the objects to be burnt, which are placed on hollow supports cooled by a current of water. These supports are moved by an endless chain arrangement, situated outside the furnace, in a direction opposite to that in which the gases move, so that the raw bricks, &c., enter the furnace at one end and emerge fully burnt at the other. In the side walls of each compartment are left vertical slots to enable the supports for the bricks to be fastened to the endless chain. The supports themselves come back to the starting point through a channel formed in the bed of the furnace.—A. G. L.

Fire-Bricks and other Clay Products; Apparatus for Turning [during Drying] — D. F. Henry, jun. Fr. Pat. 344,333, June 27, 1904.

THE moulded bricks are delivered on to a table, of the form of a paddle-wheel, which revolves horizontally in an inter-

mittent fashion, and which also carries certain boards capable of a lateral movement, which support the bricks during one stage of the operation. The whole mechanism is worked by an endless chain arrangement, which alternately works the turning table and the laterally-moving boards.

—A. G. L.

X.—METALLURGY.

Charcoal [for Blast Furnaces]; Varieties of — in the Ural. E. Juon. Stahl u. Eisen, 1904, 24, 1230—1238.

ALL the pig-iron produced in the Ural district is smelted with charcoal, which is manufactured in furnaces or by the old heap process, according to the relative facilities for transporting the felled timber. No attempt is made in either case to recover any of the by-products, there being no demand except for small quantities of tar for lubricating purposes. The three chief kinds of charcoal are birch, fir and pine; and it was to determine the relative value of these for smelting purposes that the author's experiments were made. The ultimate analysis of numerous samples of furnace-made charcoal gave the following mean results:—

—	Carbon.	Hydrogen.	Oxygen (together with Nitrogen).	Ash.	Calorific Power.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Cals.
Birch	75.04	3.49	19.83	0.90	6.380
Pine	75.38	4.13	17.17	1.24	6.500
Fir	73.41	3.45	20.63	1.26	6.210

The sp. gr. was determined in three different ways; first, that of the powdered charcoal; secondly, that of small cubes coated with molten paraffin; and thirdly, in bulk, i.e., by the basketful (1.8 cb. m.). The mean results were:—

—	Powdered.	Cubes.	Bulk.
Birch	1.46	0.40	0.190
Pine	1.40	0.27	0.148
Fir	1.38	0.215	0.131

The smaller difference in the bulk tests was due to the more brittle character of the fir charcoal, and the consequently larger amount going to the basketful. The relative porosity of the three kinds was 72.3 per cent., 80.6 per cent., and 84.7 per cent. in the order given, a result corresponding with figures published by Gubanof for Ural charcoals. The crushing strength of cubes, of 3.5 cm. side, was tested parallel and transversely to the fibres, the birch charcoal having a mean strength of 204.0 kilos. per sq. cm. in the one case and 24.8 kilos. in the other, whilst for pine charcoal the figures were 81.1 and 11.3 kilos., and for fir charcoal 52.3 and 8.1 kilos. respectively. By correlating these various results to the lowest grade, i.e., fir charcoal, as unity, the relative constants for the other two kinds work out as follows:—

—	Birch.	Pine.
Carbon content	1.02	1.03
Calorific power	1.02	1.05
Sp. gr. of the powder	1.06	1.01
" " cubes	1.88	1.25
" " bulk	1.45	1.13
Strength (diagonal)	3.45	1.48

so that bulk for bulk, birch charcoal is worth $1\frac{1}{2}$, and pine charcoal $1\frac{1}{4}$ times as much as fir charcoal. These figures coincide with the smelting values of the three charcoals, the relative amounts of iron produced per unit of charcoal being 1.8, 1.2, 1.0.

Similar results were obtained in the case of heap-made charcoals, but the mean carbon content of the latter is 11.80

per cent., and the calorific value 12.01 per cent. higher than with the furnace-made article. Taking heap-made birch charcoal as unity, the value of the furnace-made charcoal is 0.81; the two kinds of pine charcoal are worth respectively 0.68 and 0.57, and the two kinds of fir charcoal 0.54 and 0.44 respectively.

The differences between heap-made and furnace-made charcoal are due to the different temperatures employed in their production, the maxima being respectively 700° C. and 350° C. The higher temperature gives an increased carbon content, which is the chief factor in determining the calorific value for blast-furnace purposes, since the hydrogen in the charcoal does not reach the combustion zone, but goes to enrich the blast-furnace gas.

Another point of investigation was the causes of deterioration in blast-furnace charcoal. These are three in number: underburning, overburning, and bad storage. The first occurs when the temperature is kept so low (284° C.) that the percentage of carbon does not exceed 70, the charcoal being then brown in colour and of high sp. gr. Over-burnt charcoal on the other hand is of normal composition and calorific power, but brittle and rotten, with an increased power of occluding gases and moisture. Damp or prolonged storage unfavourably influences the quality by facilitating the absorption of moisture, which renders the charcoal brittle.

Finally, with regard to the problem whether a charcoal with high or low carbon content is the more economical for blast-furnace work, it is pointed out that if the charring has to be performed in the furnace the latter is uneconomically deprived of energy; but when the furnace gas is to be utilised as motive power, the carbon content of the charcoal should not exceed 85 per cent.—C. S.

Blast-Furnace Smelting; Finely-Divided Ores as a Source of Trouble in —. A. Weiskopf. Stahl u. Eisen, 1904, 24, 1225—1230.

IN smelting finely-divided iron ore in the blast-furnace, the output is liable to diminution owing to obstructions caused by the agglomeration of fine carbon, and to irregular reduction of the fine and coarse material. At the same time the charge of coke has to be increased, and the furnace works irregularly owing to the "scaffolding" of the charge. The increased blast pressure entailed by these obstructions carries away a larger proportion of dust, thus increasing the strain on the blowing engines and the labour of cleaning out the dust collectors, &c. The fine carbon settles in crevices of, and corrodes, the brick-work, and largely increases the expense of repair. The furnace gas is of inferior quality, containing an excess of carbon dioxide and dust. These evils may be prevented by using coarse ore or briquetting the fine ore, the latter a somewhat expensive process. Of the various ore-briquetting processes introduced, the author considers that only two are suitable for practical application: the Dellwik-Fleischer process and the scoria process. In the former, the ore is maintained at its sintering temperature by means of water-gas, so that the particles cohere; whilst in a modification by Elbers the agglomeration is facilitated by the addition of 3—5 per cent. of powdered slag as a flux, the total cost being about 3s. 6d. per ton. In the scoria process the ore is treated with granulated blast-furnace slag, disintegrated by steam, the mixture being then exposed to steam at a pressure of 8 atmospheres for 10 hours. The briquettes are strong, highly porous, and of homogeneous composition. Whilst the addition of slag increases the amount of residue, the hydrating action of the steam probably results in the formation of colloidal calcium hydrosilicate or of a metasilicate, distributed uniformly throughout the mass; and the water of condensation dissolves out injurious metallic salts, alkalis, sulphates, &c.—C. S.

Open-Hearth Steel; Influence of Carbon, Phosphorus, Manganese, and Sulphur on the Tensile Strength of —. H. H. Campbell. Iron and Steel Inst., Oct. 1904.

THE author concludes from the results of a large number of experiments that the tensile strength of an open-hearth steel may be expressed by a formula, showing the effects

of each of the important constituent elements. The effects of different amounts of the elements were found to be as follows:—

Carbon.—In acid steel, each 0.01 per cent. of carbon, as determined by combustion, causes an increase in the strength of 1000 lb. per sq. in. In the colorimetric determination, all the carbon present is not determined, and the strengthening effect consequently works out as 1140 lb. for each 0.01 per cent. of carbon.

In basic steel, the strengthening effect is 770 lb. per sq. in. for each 0.01 per cent. of carbon determined by combustion and 820 lb. for 0.01 per cent. determined colorimetrically.

Phosphorus.—Each 0.01 per cent. of phosphorus causes an increase of 1000 lb. per sq. in. in the tensile strength of open-hearth steel.

Manganese.—The strengthening effect of manganese on steel is greater as the content of carbon increases. When the amount of the manganese is small, the effect produced is complicated, probably by the presence of iron oxide, so that a decrease in manganese in very low-carbon steels is accompanied by an increase in strength. In acid steel, each increase of 0.01 per cent. in manganese above 0.4 per cent. raises the strength an amount varying from 80 lb. in an alloy containing 0.1 per cent. of carbon to 400 lb. in steel containing 0.4 per cent. of carbon. In basic steel each increase of 0.01 per cent. above 0.3 per cent. raises the strength an amount varying from 130 lb. in an alloy containing 0.1 per cent. of carbon to 250 lb. in steel containing 0.4 per cent. of carbon.

Sulphur.—The effect of sulphur on the strength of open-hearth steel is very small. The following formulae are given for the strength of open-hearth steels:—

(1) For acid steel, with carbon determined by combustion: $40,000 + 1000 C + 1000 P + x Mn + R =$ ultimate strength.

(2) For acid steel, with carbon determined colorimetrically: $39,800 + 1140 C + 1000 P + x Mn + R =$ ultimate strength.

(3) For basic steel, with carbon determined by combustion: $41,500 + 770 C + 1000 P + y Mn + R =$ ultimate strength.

(4) For basic steel, with carbon determined colorimetrically: $42,090 + 820 C + 1000 P + y Mn + R =$ ultimate strength.

C, P, and Mn represent 0.01 per cent. of carbon, phosphorus, and manganese respectively; R is a number varying according to the heat treatment to which the steel is subjected; the strength is given in lb. per sq. in. Tables are given showing the variation of x and y with the carbon content of the steel.—A. S.

Banket Ore [Gold]; Finer Crushing of — [on the Witwatersrand]. W. A. Caldecott. Inst. of Mining and Metall., Oct. 20, 1904.

THE crushed ore as it leaves the amalgamating plates is composed of: (a) silicious grains, mainly barren; (b) granular auriferous pyrites; (c) quartz grains with adherent pyrites; and (d) very finely divided quartz, clay, and a little auriferous pyrites and free gold, constituting the slime. The results of experiments are quoted showing that higher extractions are obtained if the portion of the pulp comprised under (b) and (c) be subjected to fine crushing before being treated with cyanide. In practice it would probably be most satisfactory to pass the "spitzlutte" concentrate continuously through a re-grinder, then over amalgamating plates, returning it thence to the mill pulp launder delivering to the tailings wheel, so that any insufficiently reduced particles might gravitate back again from the "spitzlutte" for further grinding. The author estimates that with this secondary fine crushing the present 90 per cent. recovery of the gold contents of 10 dw. banket ore would be raised to 95 per cent. at an increased expense of less than half the additional 5 per cent. of gold recovered. It should also be possible to successfully treat the large "residue dumps" on the Rand by means of a system embracing washing out the soluble gold contents, together with concentration of the coarser and pyritic

portion, followed by fine grinding of this product to render its encased gold contents susceptible to subsequent treatment.—A. S.

Lead-Tin Alloys; Action of Dilute Acids on —. O. Sackur. Arb. Kais. Ges. A., 22, 205—234. Chem. Centr., 1904, 2, 1106. (See this J., 1904, 255, 791.)

PURE lead is acted upon by dilute acids only in presence of oxygen. The rate of solution is nearly independent of the strength and concentration of the acid (acetic, lactic, and hydrochloric acids), but depends upon the concentration of the dissolved oxygen, and the rate at which the acid is stirred. Pure tin is scarcely attacked, even in presence of oxygen, by dilute acetic acid (more dilute than N/10 solution) and lactic acid (more dilute than N/100 solution). With acids of stronger concentration, the solvent action is greater, but not so great as on lead. In the case of lead-tin alloys, the solvent action of dilute acid increases continually with the proportion of lead in the alloy. Dilute acids dissolve almost exclusively lead, with but little tin from the alloys; more concentrated acids, on the other hand, dissolve more tin than lead. By the action of dilute acids on lead-tin alloys, in the first place, the lead is dissolved, but is subsequently in part precipitated again by the tin, this precipitation being more complete the greater the acidity of the solution.—A. S.

Alloys; Structure of —. W. Campbell. J. Amer. Chem. Soc., 1904, 26, 1290—1315.

Aluminium-Copper Alloys.—Alloys containing from 0 to 54 per cent. of copper form a simple series with a eutectic point at about 32 per cent. of copper. Between 0 and 32 per cent. of copper, grains and dendrites of aluminium occur in an increasing ground-mass; between 32 and 54 per cent. of copper, crystals of the compound Al_2Cu occur in a decreasing ground mass of the eutectic. In neither case are the dendrites or crystals pure; they contain about 2 per cent. of copper or of aluminium, as the case may be, in solid solution. From 54 per cent. of copper, the ground-mass of the compound Al_2Cu decreases, whilst a new constituent in the form of dendrites and then irregular masses increases, until at about 78 per cent. of copper, the alloys are homogeneous. The alloys remain homogeneous from 78 per cent. (Al_2Cu_3) to about 83 per cent. of copper ($AlCu_2$). It is not certain whether the new constituent is $AlCu$, Al_2Cu_3 , or $AlCu_2$, since it forms solid solutions; there may even be two isomorphous compounds present. The alloys containing from above 83 per cent. to about 90 per cent. of copper solidify as solid solutions, which at a lower temperature rearrange themselves, according as the alloy contains more or less than 87 per cent. of copper—the eutectoid point. This change is similar to that which takes place in steel and in the bronzes. The alloys containing from 92 per cent. to 100 per cent. of copper form a series of solid solutions isomorphous with copper and show no rearrangement in the solid state.

Ternary Tin-Antimony Alloys.—An alloy containing 75 per cent. of tin and 25 per cent. of antimony was melted with 10 per cent. of various metals, and the structure of the resulting products examined. It was found that three types of structure are produced:—

(1) When the third metal is lead or bismuth, the alloy is formed of cubes of the compound $SbSn$ in a ground-mass of tin dendrites, surrounded by the eutectic of tin and lead or bismuth.

(2) With silver or copper as the third metal, crystals of a compound of this metal and tin, together with cubes of the compound $SbSn$, are found set in the eutectic of tin and the compound of tin and the third metal.

(3) When the third metal is aluminium or zinc, this forms a compound with the antimony. The ground-mass consists of: (a) crystals of aluminium in its eutectic with tin; and (b) in the case of zinc, crystals of the compound $SbSn$ in a solid solution rich in tin. Cadmium appears to behave like zinc. Arsenic probably belongs to a subgroup of (2) where the compound $SbSn$ and crystals of a compound of tin and the third metal occur in a ground-mass, which is a solid solution of tin.—A. S.

Alloys of Tin and Antimony. W. Reinders. Appendix III. to 6th Report to the Alloys Research Committee. Proc. Inst. Mech. Eng., 1904, 1, 209—214. Science Abstracts, 1904, 7, A, 831.

THE freezing-point curve of tin-antimony alloys consists of four branches. The first begins with pure tin and ends with an alloy containing 8 per cent. of antimony, melting at 243° C. There is no eutectic point. The crystals which separate from alloys corresponding to the first portion of the curve, consist of isomorphous mixtures of tin with varying amounts (up to 11 per cent.) of antimony. The next branch of the curve is considerably steeper, and corresponds to the separation of crystals of a definite compound, Sn_2Sb , which forms small glittering cubes. The third branch of the curve begins with an alloy containing about 20 per cent. and ends with one containing about 50 per cent. of antimony. The crystals corresponding to the lower portions of this branch of the curve are not well defined, but at 50 per cent. of antimony they again have a definite form, being thick plates of the composition Sn_3Sb_2 . The crystals corresponding to the final portion of the curve are probably a solid solution of tin in antimony.—A. S.

Vanadium; Extraction of — from Lead Vanadate, and Production of Some Alloys. H. Herrenschildt. Comptes rend., 1904, 139, 635—637.

THE lead vanadate (12—14 per cent. of vanadic acid and about 50 per cent. of lead) is melted with sodium carbonate in a reverberatory furnace. Argentiferous lead is reduced and a slag is formed, containing sodium vanadate, aluminate, and silicate, and ferric oxide. The slag is again melted, air blown through to peroxidise all the vanadium, and the mass is then granulated by pouring into boiling water. This water, and the water of three washings, dissolve out practically all the vanadate, with some silicate but no aluminate. To remove the silicate, one portion is evaporated to syrup, sulphuric acid added to precipitate most of the vanadic acid, the mixture agitated with the rest of the impure solution, and the whole passed through a filter-press. The silica is thus precipitated, and the solution contains fairly pure vanadate. To prepare from it vanadic acid, it is evaporated to small bulk, excess of sulphuric acid added, the whole evaporated to dryness, heated till the excess of sulphuric acid is driven off, and the residue well washed with water. To make ferro-vanadium the purified sodium vanadate solution is precipitated by ferrous sulphate and sodium carbonate in such proportions as to yield on reduction 33 per cent. of vanadium. Nickel-vanadium is made by mixing oxide of nickel and vanadic acid in proportions to yield 25 per cent. of vanadium, compressing into cubes with the quantity of reducing substance necessary, and heating in crucibles packed with charcoal.—J. T. D.

Gold; Influence of Sunlight on the Solution of — in Aqueous Potassium Cyanide. W. A. Caldecott. Chem. Soc. Proc., 1904, 20, 199.

THE fact that the formation of potassium thiocyanate in aqueous solution, under the conditions indicated by the equation $\text{PbS} + \text{KCN} + \text{O} = \text{PbO} + \text{KCNS}$, is accelerated by bright sunlight was noted some years ago by Bettel and Feldtmann (Proc. Chem. Metall. Soc. S. Africa, 1896, 1, 267). In a paper published last year (J. Chem. Metall. Soc. S. Africa, 1903, 4, 51) by E. H. Johnson and the author, the analogy between potassium aurocyanide and potassium thiocyanate with regard to their formation and reduction was discussed.

The following experiments were carried out with the view of ascertaining whether sunlight accelerated the formation of potassium aurocyanide, as well as that of potassium thiocyanate.

A strip of gold foil weighing 882.5 mgrms. and having a total superficial area of 852 sq. mm. was immersed in a 0.5 per cent. potassium cyanide solution, contained in clear glass litre bottle at about 19° C. In another similar glass vessel, coated with three layers of black varnish, was placed a corresponding amount of the potassium cyanide solution and a strip of gold foil weighing 900 mgrms., but

with a superficial area equal to that of the other strip. The two bottles were then exposed to direct sunlight for about a 5½ hours daily during five days, and the loss of weight of the gold foil strips was noted, the maximum temperatures of the solutions being recorded daily.

The results showed that the rate of solution of the gold in the clear glass bottle was 43 per cent. greater than that in the blackened vessel, although the temperature of the solution was on an average 3.8° C. lower than in the former case.

The lately published researches of Berthelot (this J., 1904, 786) indicate that the absorption of oxygen by aqueous solution of potassium cyanide is accelerated by sunlight. The greater rapidity with which gold dissolves in potassium cyanide solution in bright sunlight may hence be considered as being due to the liberation of more nascent cyanogen, in proportion to the additional oxygen absorbed, with the consequent increased formation of aurous cyanide.

Iron [in Ores]; New Method for the Volumetric Determination of —. N. Tarugi and S. Silvatici. XXIII., page 1114.

Silicon in Iron and Steel; Determination of —. J. Thiel. XXIII., page 1114.

Nitrogen in Iron and Steel; Rapid Determination of —. H. Braune. XXIII., page 1114.

Silver in Zinc; Determination of — and Silver-Content of Varieties of Commercial Zinc. K. Friedrich. XXIII., page 1114.

ENGLISH PATENTS.

Steel; Manufacture of —. C. E. Cockburn, Swanley, Kent. Eng. Pat. 25,950, Nov. 27, 1903.

IRON ore, with or without scrap iron, is placed in, for example, a cupola furnace having the usual adjuncts, with a quantity of "dried cohesive peat-moss briquettes," which are fired, and at a certain stage of the heating, a mixture of air and water-gas is injected in regulated quantity. It is an essential condition that the reduction of the ore should be effected in an atmosphere containing an excess of carbon monoxide with hydrogen.—E. S.

Sheet Iron and Steel; Method of and Apparatus for Treating —. H. H. Goodsell, Leechburg, Pa., U.S.A. Eng. Pat. 18,746, Aug. 30, 1904.

SHEETS of iron or steel are passed through a longitudinal chamber heated by flues, which also heat a pan containing water, the steam from which enters the chamber. The steam at the entrance to the chamber is at 212° F., and the plates are sufficiently heated before entering to prevent deposition of moisture upon them. As the plates are carried forward by suitable mechanical means, they reach a "blueing" compartment, in which the steam is heated to 900° F. or more. Beyond this compartment the temperature of the steam becomes gradually lower, and the plates are cooled to 212° F. before passing out by being drawn through the water-pan.—E. S.

Blast Furnaces; Impts. in —. F. A. E. Samuelson, Thirsk, and W. Hawdon, Middlesbrough, Yorks. Eng. Pat. 28,279, Dec. 23, 1903.

THE well of the furnace is made long in one direction and narrow in the other; for example, in the form of an ellipse or of a rectangle with or without rounded ends, so that with an increased area of the well the distance of the tuyères from the central line of the well remains so short that, without increasing the power of the blast, the latter is able to penetrate to the interior of the charge. In order that the charge may descend evenly, the bushes and shaft of the furnace are constructed with the same cross-section as the well.—A. S.

Furnaces [Crucible —]. D. R. Steele, Curtis Bay, Md., U.S.A. Eng. Pat. 17,536, Aug. 11, 1904. Under Internat. Conv., Aug. 11, 1903.

SEE U.S. Pat. 743,947 of 1903; this J., 1903, 1297.—T. F. B

Alkaline Chlorides and Oxychlorides; Preserving the Strength and Keeping Powers of Solutions of — employed for Bleaching, Disinfecting, Separation of Metals, and other such like Purposes. G. J. Atkins and Oxychlorides, Ltd. Eng. Pat. 25,972, Nov. 27, 1903. VII., page 1088.

Metals from their Ores; Extraction of —. P. J. Ogle and The Rapid Cyanide Treatment, Ltd., London. Eng. Pat. 26,391, Dec. 3, 1903.

SEE Fr. Pat. 340,238 of 1904; this J., 1904, 792.—T. F. B.

UNITED STATES PATENTS.

Blast Furnace. A. Laito and J. C. Callan, Braddock, Pa. U.S. Pat. 772,723, Oct. 18, 1904.

A CONDUIT communicating with the interior of a blast furnace near the top of the latter, is provided at its end with an "explosion door," and is connected to a dust collector having a curved elbow and a portion extending downward leading to a dust receptacle. On the outer bend of the elbow of the dust collector are arranged angularly disposed plates, spaced apart, the spaces between the plates communicating with the open air. There are means for spraying water within the dust collector.—E. S.

Furnace; Roasting and Smelting —. H. Cockell and W. H. Fish, Columbus, Ohio. U.S. Pat. 772,925, Oct. 25, 1904.

THE products of combustion from the smelting furnace pass around an ore-feeding and roasting chamber. The discharge pipe from the ore-roasting chamber into the smelting furnace is connected with air-inlet and fuel-supply pipes.—A. S.

Slimes Washer. L. E. Porter, Camp Rochester, Cal. U.S. Pat. 773,221, Oct. 25, 1904.

A VERTICAL cylindrical tank, open at the top, is provided with a central, vertical, tubular shaft, and with means for rotating the latter. To the bottom of the shaft horizontal distributing arms are fixed, and connections are provided for introducing air or water into the hollow shaft. A "pervious material" is disposed around the inner upper edge of the cylinder, whilst on its outer edge is an annular trough to receive the liquid passing through the pervious material.—W. H. C.

Slimes Washer; Continuous —. L. E. Porter, Camp, Rochester, Cal. U.S. Pat. 773,222, Oct. 25, 1904.

THE apparatus in the preceding abstract is modified by having a conical bottom to the cylinder, with a valve at the apex of the inverted cone. A scraper is attached to the rotating shaft having its edge parallel to the slope of the conical bottom, and a funnel is arranged in the upper portion of the cylinder concentric with the shaft.

—W. H. C.

Alloys; Process of Making —. R. S. Anderson, Seattle, Wash., Assignor to W. F. Horner, W. C. Meeker, and H. U. Woodin. U.S. Pat. 773,450, Oct. 25, 1904.

COPPER and tin are fused together in about the proportions of 93 lb. of copper to 7 lb. of tin, and to the mixture there is added first a quantity of copper sulphate, and then aluminium in about the proportion of 2 lb. of aluminium to 5 oz. of copper sulphate, copper, and tin. The fused mass is poured off and allowed to cool in the form of pigs.—A. S.

FRENCH PATENTS.

[Steel] Plates; Process and Apparatus for Locally Softening Hardened —, Permitting them to be worked in the Cold. Schneider & Co. Fr. Pat. 338,998, Aug. 24, 1903.

SEE Eng. Pat. 19,167, 1903; this J., 1903, 1246.—T. F. B.

Nickel Steel; Impts. in —. A. de Dion and G. Bouton. Fr. Pat. 344,095, June 17, 1904.

IT is claimed that by the addition of silicon to nickel steel the breaking stress and elastic limit are considerably increased, especially in the case of the alloys of martensitic

structure, without the resistance to percussion being diminished. The proportions claimed are 0.5—2 per cent. of silicon for pearlitic steels and 0.5—3 per cent. for martensitic steels.—A. S.

Gold from Auriferous Minerals; Process for Extracting —. Worsey-Hoal Gold Extracting Synd., Ltd. Fr. Pat. 341,301, June 23, 1904. Under Internat. Conv., June 29, 1903.

SEE Eng. Pat. 14,398 of 1903; this J., 1904, 1031.—T. F. B.

Slag; Process for Making Briquettes from Blast-furnace —. H. Schulte-Steinberg. Addition, dated June 6, 1904, to Fr. Pat. 334,737, Aug. 19, 1903.

SEE Eng. Pat. 3235 of 1904; this J., 1904, 444.—T. F. B.

Aluminium and its Alloys; Industrial Process for Perfectly Soldering —. R. Fortau and E. Semprun. Addition, dated June 10, 1904, to Fr. Pat. 330,609, March 26, 1903.

SEE Eng. Pat. 13,328, 1904; this J., 1904, 986.—T. F. B.

Minerals containing Lead and Zinc; Treatment of —. C. H. T. Havemann. First addition, dated June 18, 1904, to Fr. Pat. 318,590, Feb. 11, 1902 (this J., 1902, 1457).

IN the main patent, the fumes from the melting furnace are subjected to the action of a forced draught, whereby the sulphides of lead and zinc are almost completely converted into sulphates, which are subsequently separated. According to the present addition, the conversion of the sulphides into sulphates becomes complete if (1) the composition of the furnace-charge be maintained within the limits:—zinc, 18—20; lead, 18—20; and sulphur, 12—13 per cent.; and (2) the draught be so regulated that the mud obtained on condensing the fumes is white. The process is also applicable to the treatment of minerals containing lead, zinc, and copper. A large proportion of the copper is obtained in the form of a matte rich in copper and silver, whilst the remainder is converted into sulphate with the lead and zinc. From the solution of zinc and copper sulphates obtained, the copper is precipitated by iron.—A. S.

Sulphates; Reduction of Alkaline-Earth and Alkali — to Sulphides, and of Metallic Oxides to Metals. C. Castiglioni and L. Calastretti. Fr. Pat. 343,926, June 13, 1904. VII., page 1090.

Alloy. U. Travaglini and F. Fabiani. Fr. Pat. 344,255, June 24, 1904.

THE alloy is constituted of electrolytic copper, 1.90 to 1.95 kilo.; silver, 0.2 to 0.3 kilo.; ferro-manganese, 0.6 to 1.5 kilo.; aluminium, 4.8 to 9.9 kilos.; and red phosphorus, 5 to 15 grms. The density of the alloy is stated to be 8.187, and its fusing point, 700° C.—E. S.

Air; Method and Apparatus for Extracting the Moisture from —, and for Supplying such [Dried] Air to Cupola Furnaces, Converters, or the like. J. Gayley. Fr. Pat. 344,399, June 28, 1904.

AIR is led into a refrigerating chamber in which, by the oscillation of wings and other suitable means, it is so agitated and circulated as to come into contact with a cooling tubular system, until the greater part of its moisture is deposited. The air thus dried is conveyed to a blower, preferably under a feeble initial pressure, and then forced at a higher pressure into the tuyères of the furnace or converter.—E. S.

Copper; Fusing Sulphide Ores of — with Simultaneous Concentration in the Matte. N. Lébédoff. Fr. Pat. 344,530, July 2, 1904.

THREE parts of copper sulphide ore, two parts of limestone or dolomite, and three parts of quartz sand, all in fine powder, are intimately mixed, and the mixture is exposed to an oxidizing flame in a reverberatory furnace, with addition of a suitable flux. The rich matte formed on fusion is withdrawn from the liquid layer of scoria.—E. S.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(A.)—ELECTRO-CHEMISTRY.

Temperature in Electric Furnaces; Testing the —.
F. A. J. Fitzgerald. *Electrochem. Ind.*, 1904, 2, 415.

The increase of density of pure amorphous carbon with rise of temperature is suggested as a suitable method of gauging the temperature of electric furnaces. Even after the transformation into graphite, the density increases with elevation of temperature. The examples of the application of the method refer to temperatures of a blowpipe and muffle furnace.—R. S. H.

Electrolysis and Catalysis. W. Ostwald. *Electrochem. Ind.*, 1904, 2, 393—395.

The author considers in detail the reactions occurring at the electrodes during the passage of a current through an electrolytic cell. He shows that even in the simplest cases these are made up of a number of changes which follow each other step by step, and with very different velocities. Means exist for altering the speed of some of these changes. The positive or negative (retarding) catalytic action either of the electrode material or of some substance added to or present in the electrolyte is considered as effecting this alteration of speed. Examples are given to show how these views may be applied both synthetically for favouring any particular reaction at the electrode, and also analytically for studying what reactions occur in any special case.—R. S. H.

Nitrogen [Nitric Acid] from the Air; Electrical Extraction of —. J. S. Edstrom. *Electrochem. Ind.*, 1904, 2, 399—400.

The process of C. Birkeland and S. Eyde, (of Christiania), is described (this J., 1904, 193). Their method consists in magnetically deflecting an arc at right angles to the direction of the electrodes, and thus causing it to be carried upwards and downwards, and to be broken. The speed of formation and breaking can be made very rapid, but in practice only some hundred arcs per second are used. The effects vary according to whether the arc and magnetic field are excited with direct or alternating current. If the arc be fed with alternating current, and the electro-magnet with direct current, the phenomena will appear as shown in

FIG. 1.

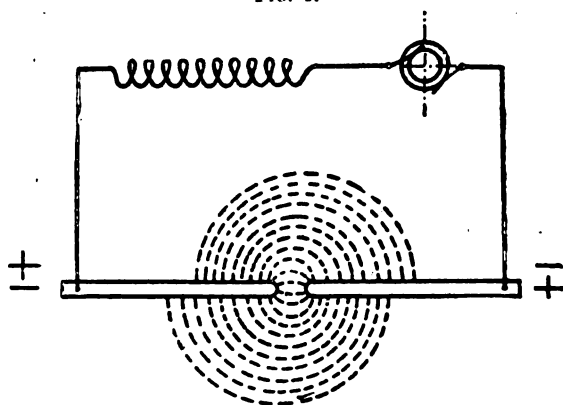
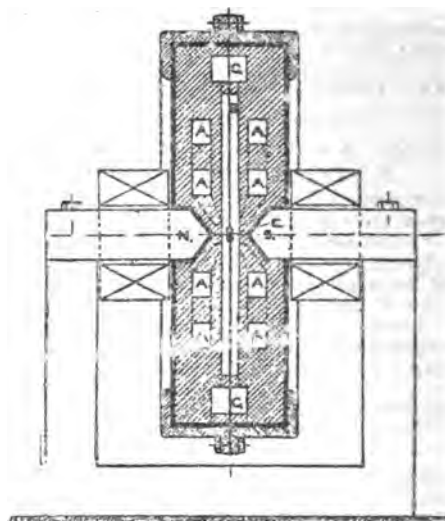


Fig. 1, the arcs vibrating between opposite sides of the electrodes. This is the arrangement chiefly used by the inventors. The electric furnace employed is shown in vertical section at right angles to the electrodes in Fig. 2. Air passes through the channels A, into the arc chamber B, around and in the neighbourhood of the electrodes, E, and out by the channel C. The gases contain 2 to 3 per cent. of nitric oxide. A 200-kilowatt furnace fed with alternating current of 50 cycles at 5000 volts gave a yield corresponding to 900 kilos. of nitric acid per kilowatt

per year. The nitric oxide (NO) is converted into nitrogen peroxide (NO₂) in a reaction tank of thin sheet iron enamelled on its inner surface. The gases pass thence to an exhaustor of clay, where they meet drips of dilute nitric acid. The gases now pass through four water towers

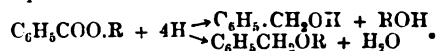
FIG. 2.



and one fed with caustic soda solution. In each tower the liquid is passed through several times for the sake of concentration. Finally, a mixture of sodium nitrite and nitrate is obtained, and from this pure sodium nitrite is manufactured, nitrates being prepared from the residual solution.—R. S. H.

Aromatic Esters; Electrolytic Reduction of —.
C. Mettler. *Per.*, 1904, 37, 3692—3696.

The methyl and ethyl esters of benzoic acid can be reduced by subjecting them in alcoholic solution, acidified with sulphuric acid, to the action of an electric current, using a lead cathode. Benzyl alcohol and benzyl-methyl- or benzyl-ethyl ether respectively are produced, according to the equations—



The halogen derivatives of benzoic acid esters can be reduced in a similar manner, the chief products being the corresponding halogen-benzyl-alkyl ethers, whilst only small quantities of halogen-benzyl alcohol are formed. By suitable oxidising agents, these halogen-benzyl-alkyl ethers can be easily converted into the corresponding halogen-benzaldehydes, many of which are of value in the manufacture of dyestuffs.—A. S.

Rotating Cathodes; Materials and Forms for —.
H. E. Medway. *XXIII.*, page 1113.

Electrolysis of Potassium Chloride and Sodium Chloride; Differences in —. F. Winteler. *VII.*, page 1087.

Defecation [Sugar]; Electrolytic —. H. Classen. *XVI.*, page 1105.

Nitric Acid; Electrolytic Determination of — with Rotating Anode. L. H. Ingham. *XXIII.*, page 1114.

Gold; Determination and Separation of — in the Electrolytic Way. S. P. Miller. *XXIII.*, page 1115.

Electrolytic Separations possible with a Rotating Anode. D. S. Ashbrook. *XXIII.*, page 1115.

Litharge for Accumulators. M. Liebig. *Z. angew. Chem.*, 1904, 17, 1674. *VII.*, page 1087.

ENGLISH PATENTS.

Batteries; Storage — W. Fairweather, London. From Vesta Storage Battery Co., Chicago. Eng. Pat. 8365, April 12, 1904.

A SUITABLE metallic cell, lined with insulating material, is connected to a horizontal cylindrical positive element of copper wire gauze or cloth, and a cylindrical negative element, consisting of a perforated copper tube, is arranged and maintained concentrically within the positive element by means of rubber insulating rings. The negative copper tube is covered first with paper, then with a cylindrical layer of linen, and finally with a tightly-fitting perforated rubber tube; copper rings or bands surround the positive element, and serve to bind the positive and negative elements together. Insulating discs are inserted within the ends of the positive element, and serve to close the ends of the negative element, the latter being provided internally and concentrically with a copper conductor, embedded in active material which fills the interior of the negative element. A screen of wire gauze of finer mesh than the positive element separates the latter from the sides and bottom of the cell. The active negative material may be oxidised silver and nickel, or silver and cobalt, which is prepared by dissolving the metals simultaneously in nitric acid, precipitating the oxides of the metals with a strong solution of potassium or sodium hydroxide, finally washing several times by decantation, and drying. The alkaline zincate electrolyte is prepared by placing a solution of potassium zincate within the battery, then, by charging the latter, depositing zinc on the positive element. The liquid is poured off, the battery cleaned, filled with a solution of pure potassium hydroxide and the battery discharged. An alternative arrangement is described with vertical elements and with an active sponge metal, containing silver, nickel, and mercury, filling the negative element, which consists of a copper shell perforated with elongated parallel apertures. The active material is prepared by dissolving the metals in nitric acid, then precipitating with potassium hydroxide and finally reducing the precipitate with zinc and hydrochloric acid. An amalgam containing 45 per cent. of silver, 45 per cent. of nickel, and 10 per cent. of mercury is obtained. An alternative form is described with a vertical positive element, consisting of rolls of copper gauze, disposed concentrically, the annular space being filled with active material of oxides of copper and cadmium, prepared by a method similar to the preparation of the oxides of silver and nickel. The copper gauze is coated electrolytically with cadmium and mercury, and with a zinc deposit on the coating. A sponge-like silver amalgam is said to be useful as active material for this type of battery, and may be prepared by dissolving silver in nitric acid, precipitating with hydrochloric acid, reducing with zinc, and drying the spongy silver. Nine pounds of sponge silver are mixed with 14 pounds of mercury, and the amalgam formed is exposed to the air for three days to bring about oxidation, "before it is placed in the negative element of the battery."—B. N.

Electrodes and Resistances; Manufacture of — G. Cornaro, Turin, Italy. Eng. Pat. 22,090, Oct. 13, 1904.

SEE Fr. Pat. 336,817 of 1903; this J., 1904, 377.—T. F. B.

UNITED STATES PATENTS.

Mercurial Alkaline Processes; Apparatus for — C. W. Roepper, Germantown, Pa., and W. E. Harmon, Mechanics Falls, Me. Assignors to American Electrolytic Co., Delaware. U.S. Pat. 771,833, Oct. 11, 1904.

APPARATUS is described suitable for mercurial alkaline processes, and comprises an amalgamating compartment and a de-amalgamating compartment separated by a main partition, with a groove or passage beneath the partition. The bottoms of both compartments slope downwards and away from the edges of the groove, the edge on the side of the amalgamating compartment being higher than the edge on the side of the de-amalgamating compartment. A return way and sluice-way for the mercury is provided,

with a partition between the sluice-way and the amalgamating compartment, and with a groove underneath for the passage of the mercury. A number of such amalgamating and de-amalgamating compartments may be arranged in a gradually descending series, the series being in two rows and sloping in opposite directions. The highest point in each pair of compartments is the edge of the groove under the main partition on the side of the amalgamating compartment. Means are provided for returning the mercury, which occupies the bottom of each compartment, from the lowest level at the extremity of one row to the highest level at the extremity of the other. Inflow and outflow pipes are provided for the solution to be electrolysed; these traverse the entire length of the partitions, and communicate with the amalgamating compartment by a series of spaced apertures above the level of the mercury. Aprons protect the apertures and guide the flow of the electrolyte, so that the latter is evenly distributed across the width of the amalgamating compartment.—B. N.

Electrically Treating Gases [Air]; Process of — K. Birkeland, Christiania, Norway. U.S. Pat. 772,862, Oct. 18, 1904.

AN electric arc is established and spread into the form of a sheet in a uniform magnetic field, and "transverse to the flux of the same." A current of the gas to be treated, such as air, is passed through the arc in a direction parallel to the surface of the sheet, and the oxide of nitrogen produced is afterwards removed from the remaining gases.—B. N.

FRENCH PATENTS.

Hydro-Electric Pile, which can be chemically Regenerated, and Method and Apparatus for its Operation. H. Jone. Fr. Pat. 339,020, Sept. 7, 1903.

SEE U.S. Pat. 764,595 of 1904; this J., 1904, 828.—T. F. B.

Carbon Electrodes for Primary Cells; Process for Preparing — T. Mann. Fr. Pat. 344,312, June 25, 1904.

IN order to prepare an electrode of good conductivity, the carbon is compressed around a piece of gauze or foil, formed of a metal which is a good conductor and is not acted upon by the electrolyte to be employed. The piece of gauze or foil may be provided on one side with projecting filaments, so that more perfect contact with the carbon is obtained.—A. S.

(B.)—ELECTRO-METALLURGY.

Iron and Steel; Electro-Metallurgy of — P. L. T. Héroult. Electrochem. Ind., 1904, 2, 408–409.

THE different processes which the author has worked out for the electric furnace manufacture of ferro-chromium, crude iron, and fine steel are briefly described. The electric treatment is considered to be particularly suitable for refining ordinary grades of steel, e.g., the molten product of a Siemens-Martin furnace, so as to obtain a fine metal containing less than 0.01 per cent. of sulphur and 0.01 per cent. of phosphorus, and with as low a carbon content as desired. The product obtained is at least equal in quality to the best grades of crucible steel.—R. S. H.

Nickel Steel from Magnetic Sand; Preparation of — E. A. Sjöstedt. L'Electricien, 1904, 27, 270. Chem. Zeit., 1904, 28, Rep. 330.

THE magnetic sand obtained at Sudbury, Canada, contains 2–3 per cent. of nickel and 1–2 per cent. of copper. After mechanically separating the portion rich in copper, the average composition of the sand is found to be:—Nickel, 3 per cent.; copper, 0.5 per cent.; sulphur, 28 per cent.; iron, 50 per cent.; and phosphorus, 0.01 per cent. This is roasted and then smelted with coke and lime in an electric furnace of the usual type; the product contains about 8 per cent. of nickel, 53 per cent. of iron, and 3 per cent. of sulphur. By this means it is stated that 27 kilos. of nickel steel can be produced in one hour, by employing 108 kilowatts, the cost being computed to be 105.5 marks per ton.—T. F. B.

Electro-plating; Chemistry of — W. D. Bancroft.
Electrochem. Ind., 1904, 2, 389—391 and 400—401.

THE following conclusions are illustrated by details of special cases occurring in practice. A non-adherent deposit is always due to the precipitation of some salt or metalloid along with the metal; the function of many additions to plating baths being solely that of dissolving these salts or metalloids. Any beneficial action due to the presence of a reducing agent in the bath is probably owing to the removal of the dissolved oxygen. A fine-grained deposit is favoured by high current-density and potential difference, by the use of acid or alkaline solutions, by low temperature, and by the addition of colloidal substances to the bath.—R. S. H.

Electrolytic Deposition of Aluminium from Ethyl Bromide Solutions. H. E. Patten. Electrochem. Ind., 1904, 2, 413.

A SOLUTION of aluminium bromide in ethyl bromide gives a deposit of crystalline aluminium, provided the solution is sufficiently concentrated and the current density exceeds 0.0023 ampere per sq. cm.—R. S. H.

Metal Deposition from Rapidly-Stirred Electrolytes; Theory of — R. Amberg. Z. Elektrochem., 1904, 10, 853—855.

INSTEAD of considering the effect of rapid stirring as connected with the virtual volume of the electrolyte, as in a previous communication (this J., 1904, 684), the author applies Nernst's theory of reaction velocity in heterogeneous systems. According to this theory, the velocity of reaction is conditioned only by the rate at which the differences of concentration between the bounding layer, and the two phases are equalised by diffusion.—R. S. H.

Anodic Solution of Metals and their Passive State. O. Sackur. Z. Elektrochem., 1904, 10, 841—844.

THE author considers the anodic solution of all metals to be conditioned by one and the same reaction, viz., the discharge of hydrogen ions. For instance, with a divalent metal $M + 2H^+ \rightleftharpoons M^{++} + H_2$. If the removal of the hydrogen can be effected by reaction with one of the discharged anions present, the metal will continue to dissolve; this is, for instance, the case with chlorides, bromides, &c.; the velocity of reaction of the discharged oxygen ions from most of the other salts is, however, sometimes very low. The greater the catalytic influence of the particular metal used for electrode upon this reaction, the more easily will that metal dissolve. The author therefore considers that the power which metals possess of assuming the passive condition is inversely proportional to the magnitude of their catalytic effect in the reaction between hydrogen and oxygen.—R. S. H.

ENGLISH PATENTS.

Metals such as Lead and Silver; [Electrolytic] Process for Extracting — from Ores. S. Ganelin, Friedmann, and Accumulatoren Fabrik Akt.-Ges., Berlin. Eng. Pat. 1767, Jan. 23, 1904.

SEE Fr. Pat. 339,849 of 1904; this J., 1904, 718.—T. F. B.

Zinc from Sulphate Solutions; Producing — by Electrolysis. C. D. Abel, London. From Siemens and Halske A.-G., Berlin. Eng. Pat. 16,396, July 25, 1904.

THE current density at the anode, either over its entire surface or at separate parts, is from 20 to 50 times greater than that at the cathode. Platinum or platinum alloys may therefore be used as the anode, and electrolytic zinc, hard, smooth, dense, crystalline, and free from sponginess and nodules, is obtained.—B. N.

FRENCH PATENTS.

Electric Induction Furnace; New System of — Schneider et Cie. Fr. Pat. 339,010, Sept. 2, 1903, and Addition thereto of Nov. 12, 1903.

SEE Eng. Pat. 28,805 of 1903; this J., 1904, 549.—T. F. B.

Electrostatic Separation; Process of — F. O. Schnelle. Fr. Pat. 344,068, June 14, 1904. Under Internat. Conv., June 15, 1903.

THIS invention relates to the separation of minerals, the individual constituents of which possess varying degrees of electric permeability. The material is fed uniformly over the surface of a body of suitable shape, the sides of which are inclined, and the lower edge horizontal, and which is connected with one pole of a source of electric current. A field of intense electrostatic force is produced around the edge of the charged body by connecting the receivers placed below, with the earth, or with the other pole of the source of electric current. The particles of material, in falling from the electrically charged body, are projected varying distances according to their electric permeability and are collected in separate receptacles. An oscillating movement may be imparted to the electrically charged body.—A. S.

Titanium; Electrolytic Extraction of — from its Oxides Elektrochem. Werke G. m. b. H. Fr. Pat. 344,099, June 17, 1904. Under Internat. Conv., June 18, 1903.

THE electrolyte used consists of dry halogen salts of the alkaline-earth metals heated to moderate redness. Before or during electrolysis the titanium oxide is introduced into the containing vessel, as near as possible to the cathode. When sufficient current has been passed to reduce the titanium oxide, the electrolysis is discontinued, and, after cooling, the titanium is separated from electrolyte by lixiviating it with water and with dilute hydrochloric acid, the alkaline-earth chlorides being recovered from the solution by evaporation and calcination, and used over again.—A. S.

Nickel or its Alloys; Manufacture of — G. H. Gin. Fr. Pat. 344,202, June 22, 1904.

NICKEL oxide, or an ore of the oxide, is reduced in an electric furnace in presence of silica and carbon, to obtain either a nickel silicide, or a double silicate of iron and nickel. These are refined in a "four-canal" (Ger. Pat. 148,253), mixed with calculated proportions of nickel oxide or iron oxide, or a mixture of the two, according to whether it is desired to obtain pure nickel or ferro-nickel. Sulphur may be eliminated in the process by addition of a small proportion of manganese silicide.—E. S.

Alumina; Preparation of — by an Electro-Metallurgical Process. Soc. Anon. Electro-Metallurgique, Procédés P. Girod. Fr. Pat. 344,549, July 4, 1904.

THE alumina is obtained as a by-product in the manufacture of ferro-chromium by utilising bauxite as a flux in place of lime. During the process the bauxite becomes thoroughly dehydrated, and any silica and iron oxide it contains are reduced, so that the slag consists of nearly pure alumina.

—R. S. H.

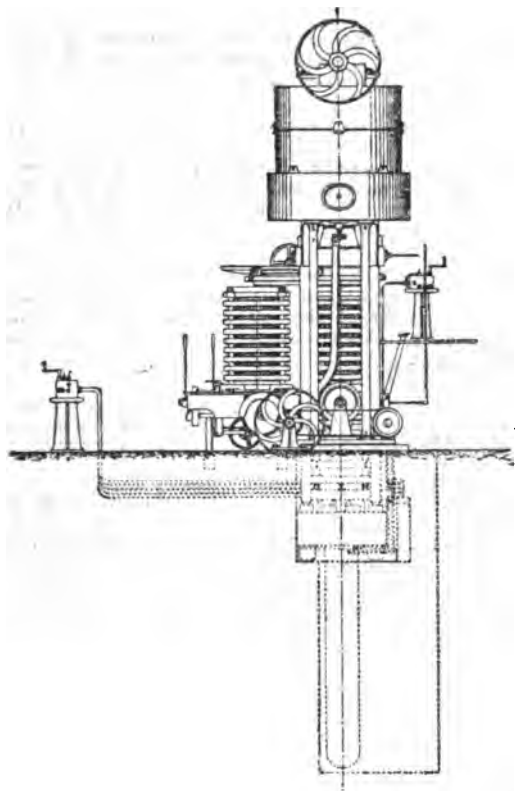
XII.—FATTY OILS, FATS, WAXES, AND SOAP.

Oils and Fats; Uses and Applications of — J. Leukowitsch. Cantor Lectures. J. Soc. Arts, 1904, 52, 795—805, 809—815, 819—832.

Raw Materials.—In this country coconut oil and palm and palm kernel oils are still the principal vegetable fats extensively used, but on the Continent other fats are largely employed, e.g., Chinese vegetable tallow and shea butter in Marseilles and the North of Europe. Only small quantities of these fats and other fats, such as mowrah-seed oil and mahwah butter, are imported into England. The use of fast steamers in place of sailing vessels has led to a great development of the commercial fish oil industry. As regards animal fats our chief sources of supply are now Australia, New Zealand, and the Argentine. Russia no longer exports tallow, but imports it largely from Australia.

Recovery of Oils by Expression.—In modern installations seeds rich in oil are frequently expressed in a hydraulic press known as a "clodding press," to avoid the exudation

of the mass through the cloth in the plates of the ordinary Anglo-American press. This press (see figure) is provided



with a seed kettle at the top, in which are openings corresponding with the chamber in the head of the press or series of presses. The material is introduced into the circular press box, and each successive layer covered with a circular metal plate until the press is full, when pressure applied by the ram forces the box against the block at the head of the press. The press cake is broken up and pressed a second time in the Anglo-American press. In modern improved processes this second expression is also done in a press of the same type as the "clodding press," so that the work becomes practically continuous.

Recovery of Oil by Extraction with Solvents.—The solvents employed on a large scale are still petroleum spirit and carbon bisulphide. The use of carbon tetrachloride in technical processes has been prevented by its high price, and by its physiological effect on the workmen, which resembles that of chloroform.

Purification.—In the author's experience manganese dioxide with hydrochloric acid is the best bleaching agent for tallow, and bichromate with hydrochloric acid for palm oil. Bleaching by ozone or oxygen is only used to a limited extent. The author has found that the colour of oils bleached by certain ozone processes eventually becomes dark again. The old natural process of "demargarination" for cotton-seed oil has become too expensive, owing to the large storage room required, and has been largely replaced by an artificial process of refrigerating the oil and separating the "stearin" by means of filter- or hydraulic presses. This has led to the introduction of various oils (e.g., arachis and Tunisian olive oils) as edible oils, which hitherto were objectionable on account of depositing "stearin."

Lard Substitutes.—Special cooling machinery is largely employed. The melted mixture of fats is cooled by means of a hollow cylinder through which flows chilled brine, and the sheet of fat deposited on the surface is removed at once by means of a pump.

Chocolate Fats.—The most suitable substitutes for cacao butter are prepared from the harder portions of palm-nut and coconut oils, which are made to crystallise at a temperature slightly over the normal atmospheric temperature, and the crystalline mass is expressed. To raise the melting points of such fats, animal fats are sometimes added as stiffening agents, but, unless carefully refined, animal fats, such as tallow and tallow stearine, may impart an unpleasant flavour to the chocolate. The author suggests the use of some of the tropical vegetable fats of higher melting point as suitable for this purpose, e.g., margosa oil, mowrah-seed oil, &c. (see this J., 1903, 593).

Burning Oils.—Rape oil is still largely used on the railways in this country, whilst in America lard oil, and in Italy olive oil, are employed for the same purpose. The whiter qualities of whale and seal oil are still in demand for illuminating lighthouses.

Lubricating Oils.—Rape oil is still the favourite lubricant for railways, and it is a curious fact that India should export nearly the whole of the rape-seed crop to this country, and import rape oil for her railways. The high price of castor oil a few years ago gave an impetus to the manufacture of "blown" cotton-seed, maize, seal oils, &c. as substitutes. The author states that the suitability of these oils for lubricating purposes is still open to question, and that their tendency to gum and their low flashing points have been mentioned by many engineers as objections to their use.

Paint Oils.—Attention is called to the suitability of safflower oil and candle-nut oil for this purpose. Linseed oil bleached by sunlight still holds the first place as the oil for artists' colours. The author has investigated several of the processes of bleaching linseed oil by means of ozone, and considers that they offer no advantage over the method of bleaching by sunlight.

Boiled Oils.—At the present time most of these are prepared by heating linseed oil with "driers" to a temperature not exceeding 150° C., the process being carried out in a cylindrical vessel provided with a heating coil and stirring arrangement.

Sulphonated Oils.—The price of castor oil is now so low that at the present time it would not pay to use other oils for this purpose.

Hydrolysis of Oils and Fats (see this J., 1903, 67, 1094).—Twitchell's reagent, prepared by the action of sulphuric acid in excess on a solution of oleic acid in aromatic hydrocarbons, gives a better emulsion with fats than either hydrochloric or sulphuric acid, practically complete hydrolysis being effected on heating the fat with 1 to 1½ per cent. of the sulpho-aromatic compound in a current of steam, the initial reaction being promoted by the presence of a small amount of free fatty acids. In the following experiments 100 grms. of the oil or fat were heated with 1 per cent. of the reagent in open flasks:—

		Oil or Fat.					
		Cotton Seed.	Whale.	Rape.	Lard.	Tallow.	Cocconut.
Original value.	acid	5.67	6.01	2.16	2.6	11.15	18.75
	2 hours	8.75	14.99	8.4	11.37	15.03	114.0
	7 "	61.28	48.69	23.24	38.66	25.68	221.1
	9 "	99.8	63.72	30.59	58.73	43.44	232.0
	12 "	129.4	72.42	44.26	82.42	49.89	233.2
	14 "	137.6	80.8	50.57	90.81	50.11	236.2
	16 "	148.7	84.31	53.0	98.49	52.03	236.2
	18 "	150.1	85.82	55.4	107.3	53.1	237.2
	20 "	155.9	89.68	56.58	107.9	53.85	237.9
	22 "	157.9	90.71	56.72	109.0	55.6	238.9
	24 "	161.4	91.67	57.91	110.5	57.11	239.5
	26 "	164.5	91.67	59.58	112.0	59.82	239.8
	28 "	165.2	91.7	60.6	115.2	60.23	239.8
	30 "	166.3	94.69	61.46	118.3	63.95	240.6
	32 "	167.0	97.88	61.61	118.6	66.2	240.9
	34 "	168.4	98.07	61.87	119.1	67.3	241.0
	36 "	168.9	98.9	62.3	120.2	68.5	241.2
Acid value after							

The most thorough emulsion of all is obtained by means of enzymes, and this supports the author's theory that the various agents used to bring about hydrolysis act as

accelerators or "catalysts," the actual hydrolysis being effected by water. Moreover, in the case of basic materials, e.g., calcium oxide and caustic alkalis, a similar view can be held. Thus it is possible to effect complete hydrolysis by heating the fat with 1 per cent. of lime (as accelerator) in an autoclave under pressure, whilst in the case of caustic alkalis the more rapid hydrolysis may be attributed to the formation of a water-soluble soap, which assists the emulsification of the fat.—C. A. M.

Soap and Candles; Manufacture of — J. Lewkowitsch. Cantor Lectures. J. Soc. Arts, 1904, 52, 833–842.

Candle Industry.—In the older processes of hydrolysing the fats to obtain the free fatty acids, the reaction is somewhat slow, which the author considers may be due to incomplete admixture of the fat with the water. In the recent method of using seed enzymes in the hydrolysis, there is much more thorough emulsification, and in experiments on a manufacturing scale cotton seed oil has been hydrolysed up to 90 per cent. Tallow is much more refractory in this process. Since, however, enzymic hydrolysis at its best has not been quite complete, the author regards it as useless to the candle-maker. As regards Twitchell's reagent (see preceding abstract) the author has obtained the best results with the sulpho-compound of naphthalene.

Cotton Seed Oil containing Free Fatty Acids, hydrolysed with 1 per cent. of Reagent.

	Sulpho-aromatic Compound of		
	Naphthalene.	Anthracene.	Phenanthrene.
Original acid value	8.3	8.3	8.3
" 6½ hours	30.9	15.01	42.3
" 13 "	194.1	60.5	150.9
Acid value 194 "	216.9	112.4	156.4
" 26 "	210.7	147.2	181.6
after 35½ " .....	..	145.2	184.2
" 39 " .....	..	189.8	204.2
45½ " .....	..	202.8	204.2

In working on the large scale it is necessary to use a fat with the addition of a small percentage of free fatty acids, since otherwise the reaction does not start rapidly. This process has been introduced into several works in the United States as specially suitable for low-class material that could not be profitably worked in an autoclave. It has the drawback of yielding somewhat dark-coloured fatty acids, which are unsuitable for soap-making. In the processes in which the hydrolysis is carried out by means of an accelerator in an autoclave, the high pressure

is liable to cause bulging eventually. Hence spherical autoclaves (see Fig. 1) have been introduced. The oleic acid, separated by hot pressure from the solid fatty acids, contains a considerable amount of "stearin," which is deposited by cooling the mixture in tanks, or more rapidly by means of Petit's refrigerating wheel. This consists of a hollow wheel through which passes chilled brine. As it revolves it dips into a trough containing the oleic acid, and carries up a thin film, which rapidly cools, and deposits "stearin" crystals. The crystalline mass is removed by means of a scraper, and falls into a tank, whence it is pumped into a filter-press. The separated crystals may then be added to a fresh lot of candle material at a suitable stage, whilst the oleic acid may be partially converted into solid compounds. This conversion of oleic acid takes place to some extent in the acid saponification process, where sulphuric acid is used as the reagent, and the latter process is therefore a favourite one for working up poor material containing little glycerin. The loss from the destruction of glycerin is compensated by the increased yield of solid candle material. Thus taking the yield of palmitic and stearic acids from tallow to be 45 to 47 per cent. in the autoclave process, the yield of solid material from the same fat by the acid saponification process is about 63 per cent.

Soap Industry.—A machine devised by the author (this J., 1893, 597) for rapidly cooling soap has proved unsuitable for household soaps, owing to its destroying their crystalline structure. But the same principle (that of the candle-moulding machine, Eng. Pat. 4581 of 1893) has been embodied in a recent patent by Schnetzer. Klumpp's apparatus for the same purpose resembles a copying press with closed sides, in which the hot soap can be rapidly cooled and compressed, whilst Schrauth's

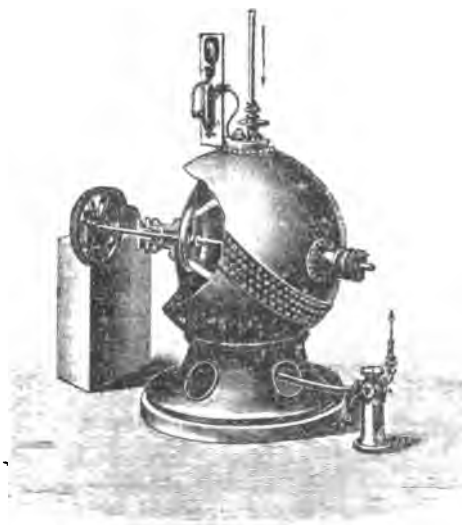
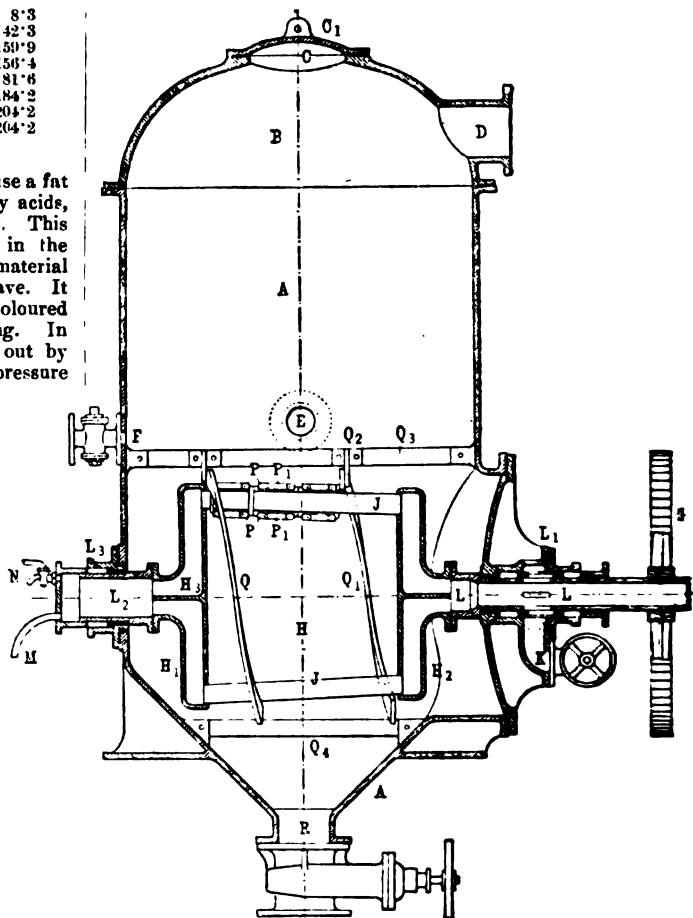


FIG. 1.

FIG. 2.
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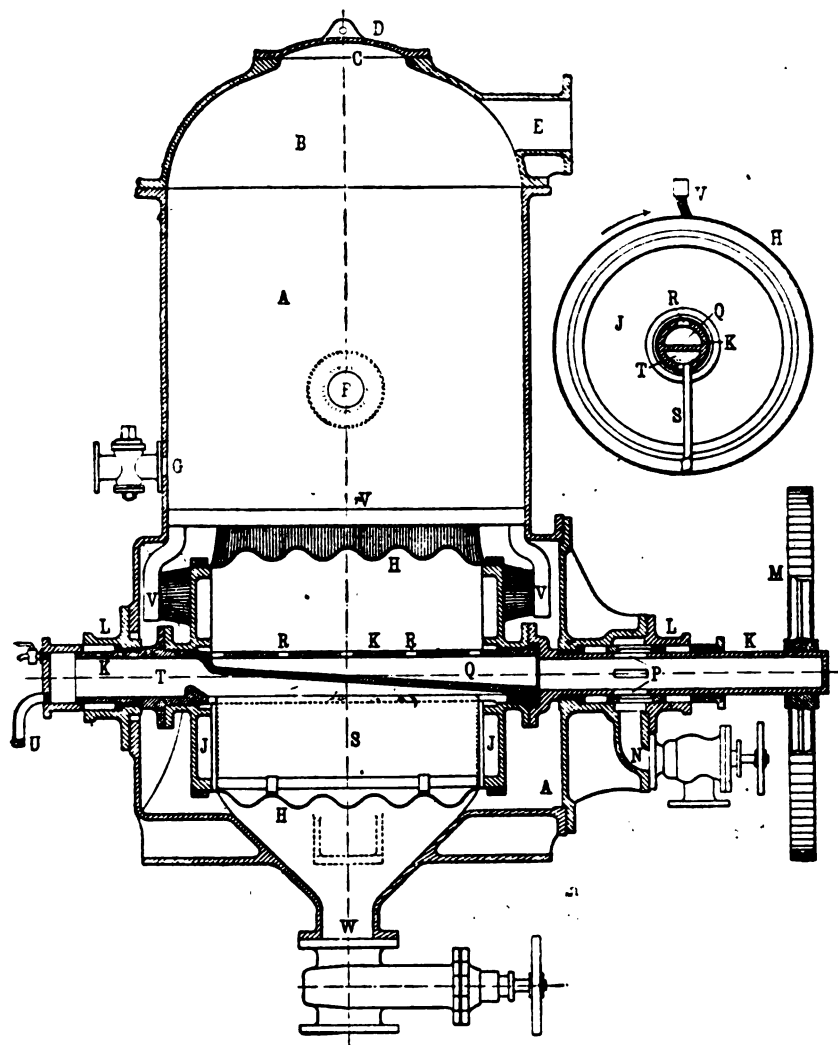


FIG. 3.

patent is based on the principles underlying both the preceding patents. The development of the uses for nitroglycerin has made it profitable to recover glycerin from the soap leys, and in England, America, and France this is done in the most important soap works. Numerous attempts have recently been made to obtain the glycerin from the fats first, and then to convert the fatty acids into soap. Autoclave methods tried and found wanting in this country are being revived on the Continent, and, in order to lessen the darkening effect of the autoclave process on the fatty acids, reduced pressure has been employed, with the result that whilst a better-looking product has been obtained, there is from 15 to 20 per cent. of unsaponified fat present, the glycerin in which it does not pay to recover subsequently from the soap leys. It is, however, acknowledged, even on the Continent, that first-rate soap cannot be produced by the autoclave process.

Soft Soaps, made from autoclave material, and so containing little glycerin, are dark in colour, unpleasant in appearance, and will not "hold water." Moreover, the absence of glycerin from soft soaps is objected to by woollen manufacturers, since the glycerin gives a gloss and soft feel to their best materials, e.g., cashmeres.

Recovery of Glycerin.—In modern works the old Wetzel pan has been replaced by a vacuum-tube evaporator similar to those used in sugar works. In the case of glycerin

solutions from the acid saponification process, it is necessary to use similar apparatus to that illustrated in the preceding for soap-lye glycerin, since otherwise the calcium sulphate that separates out on concentrating the liquid would form a crust on the tubes and reduce the evaporating effect. In the earlier attempts to recover glycerin from soap leys the concentration was carried out in fire-heated pans, the sides of which were kept free from deposit by stirring and scraping devices. Then tube evaporators heated by steam were tried, but it was found that the tubes were liable to be completely stopped. The author has therefore patented the apparatus shown in the Figs. 2 and 3, which have proved suitable in practice for the concentration of such leys. It will be seen that the heating surface is kept clean by a mechanical arrangement, so that the salt falling to the bottom can be drawn off into a vessel beneath. This apparatus, is constructed in single effect and double effect, the latter combining a tube evaporator with the apparatus as illustrated by Figs. 2 and 3. The soap leys are concentrated in the vessel, B, until they reach the point at which the salt begins to deposit. They are then transferred to the vessel A, and the boiling continued, the salt being meanwhile removed as it falls out, until eventually the glycerin reaches a concentration of 1·3 sp. gr., when it is withdrawn. A triple effect apparatus is constructed on similar lines.—C. A. M.

Olive Oil; Formation of Free Acid and Production of Rancidity in —. R. Marcille. Essay at the Oil Culture Congress at Sfax (Tunis). Chem. Centr., 1904, 2, 1064.

THE formation of free acid is due chiefly to the action of lower organisms, especially mould fungi, which secrete a ferment capable of hydrolysing fats and assimilating the glycerin produced. The formation of acid frequently occurs in the olives themselves, when they are badly preserved. The production of rancidity, on the other hand, is caused by the absorption of atmospheric oxygen; the unsaturated fatty acids become saturated and in part are decomposed. The absorption of oxygen is accelerated by heating and still more by exposure to light. The harsh and astringent taste characteristic of rancid olive oil is due to the formation of volatile fatty acids. The author recommends that the freshly-picked olives never be preserved for more than three to four days in heaps; that separation of the oil from the "margines" be effected more expeditiously; and that the oil be preserved in flask-shaped vessels of yellow glass filled up to the neck.—A. S.

Refractometer Scale for use with Fats and Oils; Comparative —. A. E. Leach and H. C. Lythgoe. XXIII. page 1113.

Cholesterol. A. Windauz and G. Stein. XXIV., page 1117.

Yeast; Some Constituents of —. O. Hinsberg and E. Roos. XVII., page 1107.

ENGLISH PATENTS.

Substances of Fatty Nature that are Hard at Ordinary Temperatures; Method of Rendering — Plastic. F. Lausen, Aarhus, Denmark. Eng. Pat. 17,866. Aug. 17, 1904.

THE material is subjected while in a soft condition to the action of a current of cold air or other inert gas. The gas may be introduced under pressure, and then allowed to expand suddenly, with the result that the heat absorbed by the expansion causes the material to solidify and retain particles of gas distributed throughout the mass.—C. A. M.

Glycerin and Other Products from Distillers' Wash and other Industrial Liquids; Process for Obtaining —. L. Rivière, Paris. Eng. Pat. 16,836, July 30, 1904.

SEE Fr. Pat. 338,962 of 1903; this J., 1904, 1035.—T. F. B.

UNITED STATES PATENT.

Hydroxystearic Acid; Process of Making —. W. M. Burton, Assignor to Standard Oil Co., Chicago. U.S. Pat. 772,129, Oct. 11, 1904.

OLEIC acid is diluted with a liquid hydrocarbon of the paraffin series, and is converted into a "saturated oleic acid" by adding a suitable polymerising agent, e.g., sulphuric acid; steam is blown through the mixture, and the aqueous portion is separated. On adding hot petroleum spirit to the oily portion and cooling the solution, hydroxystearic acid crystallises out.—T. F. B.

FRENCH PATENTS.

Oils and Sulphonated Fats; Manufacture of Compounds from —. J. Stockhausen. Fr. Pat. 344,125. June 18, 1904. ✓

CLAIM is made for emulsions miscible with water in all proportions prepared by mixing an oil (notably mineral oil) or carbon tetrachloride with the gelatinous soap obtained by saponifying sulphurated castor or other oils. (See Fr. Pat. 253,578.)—C. A. M.

Glycerin; Extraction of — from Industrial Liquids containing it, and notably from Distillery Residues. E. A. Barbet. Fr. Pat. 544,036, April 16, 1904. XVII. page 1108.

Soap; Machinery for Manufacture of —. Soc. Talvande Frères and Douault. Fr. Pat. 344,006, June 15, 1904. ✓

THE liquid soap runs from an upper tank into a series of vertical rectangular moulds, round which circulates a current of cold water. Above the tank is a funnel in which the pressure of the liquid soap compensates for the contraction caused by the solidification of the material in the moulds. When the soap has set, the upper tank and funnel are removed and the moulds emptied by means of pistons which force the slabs upwards against a system of cutting wires.—C. A. M.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(A).—PIGMENTS, PAINTS.

Lead Compounds [White Lead]; Raw Materials for the Preparation of —. M. Liebig. Z. angew. Chem., 1904, 17, 1671—1672.

THE lead for white-lead preparation must be as pure and soft as possible. A trace of bismuth favours the oxidation of the metal; iron and copper hinder it. The latter metals are estimated colorimetrically by dissolving in nitric acid, precipitating the lead as sulphate, evaporating to small bulk, and adding to one half potassium thiocyanate, to the other ammonia. The colours struck are compared with those of iron and copper solutions of known strengths. The coke used to prepare carbonic acid must be thoroughly burnt and desulphurised, or lead sulphate will be formed, which protects the metal from the action of the acetic acid. For the German (chamber) process 15 per cent. acetic acid, for the French (drum) process 80 per cent. acetic acid is used. Its strength is determined by titration with alkali and phenolphthalein. The sodium nitrate for litharge and nitrite preparation is "refined saltpetre," containing 96—97 per cent. of sodium nitrate. It is usual to determine in samples of it the moisture and the chloride; the latter should not exceed 0.05 per cent. A direct determination of the nitrate by the nitrometer is also sometimes advisable.—J. T. D.

White Lead; Manufacture of —, by the German (Chamber) Process. M. Liebig. Z. angew. Chem., 1904, 17, 1672—1673.

SEVERAL indications help to control this process. The temperature should be kept at 59°—60° C. A slight excess of acetic acid should always be present, so that the lead acetate draining away should be faintly acid. The percentage of acetic acid in the evaporation pans should be 0.6—0.9. If a test shows more than this, there is too much acid or too little water; if the former, the lead-acetate drainage will be high, both in acidity and in lead content. Lack of water and of carbon dioxide is shown by the formation of stalactites of acetate or basic lead acetate. Too much carbon dioxide is to be avoided, as it converts the lead hydroxide into carbonate, and lessens the covering power of the final product. If the chamber, on inspection after 14 days, does not show a sufficient corrosion, the cause is hard lead, sulphur in the coke, or lack of air. In the first case, a repacking with new lead is the only remedy. In the second, a thorough washing with water may be effective. In the third, additional air must be allowed to enter. With insufficient air, a yellowish or reddish tint in the product, due to the formation of suboxides, is often seen; this disappears on further working of the chamber. In the grinding process, any adhering acetate is precipitated by alkali; the waste waters must be tested to see that neither lead acetate nor excess alkali is contained in them. The white lead should not be dried at a temperature above 70°—80° C., or it is apt to assume a yellow or brownish tint.—J. T. D.

White Lead; Manufacture of — by the French [Drum] Process. M. Liebig. Z. angew. Chem., 1904, 17, 1674.

THE litharge used must be calcined to oxidise any metallic lead and decompose any peroxide it may contain. To test

when sufficient carbon dioxide has been added to the basic acetate prepared from this litharge, a 1 per cent. mercuric chloride solution is used, and the process judged by the amount of the precipitate formed. In the grinding process metallic lead, lead acetate, and lead sulphate should be tested for.—J. T. D.

Red Lead; Manufacture of — M. Liebig. *Z. angew. Chem.*, 1904, 17, 1674—1675.

THE temperature in the furnace should not exceed 300°—350° C., or loss of oxygen is likely to occur. In red lead used as paint only the tint and the fineness are of importance. The latter is judged by suspending 10 grms. in water in a tall narrow cylinder, and noting the times of clearing by settlement through each successive 10 c.c. Impurities of lower specific gravity can also be sometimes detected in this way. Red lead for glassmaking must be free from adulterations, and from iron and copper. To test, the sample is dissolved in nitric acid (sp. gr. 1.24), and oxalic acid added till all peroxide is reduced. Any residue is examined for barium sulphate, ferric oxide, ground brick, &c. The filtrate, after removal of lead, is tested for copper by ammonia, and for iron by thiocyanate. Red lead for matchmaking is valuable in proportion to the peroxide it contains: this may vary from 28 or 30 to 33 per cent. Orange lead is usually made from white lead produced by the French method; it is less dense than ordinary red lead, and has a more vivid colour.—J. T. D.

UNITED STATES PATENT.

Lakes from Sulphur [Sulphide] Dyes; Process of Making — R. Gley, Assignor to Act.-Ges. f. Anilinfabrik, Berlin. U.S. Pat. 772,931, Oct. 25, 1904.

SEE Fr. Pat. 341,246 of 1904; this J., 1904, 873.—T. F. B.

FRENCH PATENT.

Lakes; Production of — [from Azo Dyestuffs]. Farbenfabr. vorm. F. Ruzel et Cie. Fr. Pat. 344,395, June 28, 1904. IV., page 1085.

(B.)—RESINS, VARNISHES.

UNITED STATES PATENTS.

Pine Oils from Wood; Process of Manufacturing — F. S. Clark and E. A. Harris. U.S. Pat. 771,859, Oct. 11, 1904. III., page 1082.

Linoleum; Material for Use as a Substitute for — E. V. Clausen, Nørre Nebel and C. A. Heilmann, Skjelskør, Denmark. U.S. Pat. 773,276, Oct. 25, 1904.

SEE Eng. Pat. 19,233 of 1903; this J., 1903, 1358.—T. F. B.

Floor Coverings and Plastic Wall and Ceiling Facings; Manufacture of — G. R. Schmitt, Munich, Germany. U.S. Pat. 773,427, Oct. 25, 1904.

CLAIM is made for floor-covering material consisting of linoxyn (100 parts), rosin (30 parts), turpentine (30 parts), and waste-paper pulp containing 20 per cent. of water (150 parts). A plastic mass, obtained by heating these ingredients together, may be worked into slabs, strips, &c., suitable for wall and ceiling facings.—C. A. M.

FRENCH PATENTS.

Gum [and Resins]; Process for Dissolving Hard and Semihard — H. Terrisse. Fr. Pat. 344,300, June 25, 1904. Under Internat. Conv., June 30, 1903.

SEE Eng. Pat. 14,554 of 1903; this J., 1904, 552.—T. F. B.

(C.)—INDIA-RUBBER, &c.

Gutta-Percha; Occurrence of Cinnamic Acid Esters in Different Kinds of — P. van Romburgh. Ber., 1904, 37, 3440—3443.

FROM the resin of a specimen of gutta-percha from Dutch New Guinea, the author isolated an amorphous substance,

which, when boiled with alcoholic caustic potash, yielded cinnamic acid and an alcohol melting at 177°—178° C. and containing 84.2 per cent. of carbon and 11.85 per cent. of hydrogen. From the resin of gutta-percha from *Paladium calophyllum*, two substances were isolated, melting at 145° and 228° C. respectively, both of which were found to be esters of cinnamic acid. A compound closely resembling the high-melting product from the gutta-percha of *Paladium calophyllum* was isolated from a low-grade commercial gutta-percha from Amsterdam; after repeated crystallisation from ethyl acetate, it melted at 237.5° C. (corr. 242° C.). When boiled with alcoholic caustic potash, it yielded cinnamic acid and an alcohol melting at 210° C. The same alcohol was also prepared from the high-melting ester of cinnamic acid isolated from *Paladium calophyllum*. Tschirch's crystal-alban (this J., 1903, 1250) was found to be identical with the ester of cinnamic acid, melting at 237.5° C., described above. The presence of esters of cinnamic acid was also proved in a number of other kinds of gutta-percha. Gutta-percha from *Paysona Leerii* is, however, free from esters of cinnamic acid.—A. S.

Vulcanisation-Coefficients. C. O. Weber. *Gummi-Zeit.*, 1904, 83—84.

THE author originally introduced the vulcanisation-coefficient of india-rubber entirely on technical grounds, and agrees with Esch that they should be calculated as the percentage of sulphur to pure india-rubber and not the percentage of sulphur in the vulcanised product. When given in this manner, different coefficients can be compared directly without further calculation. The author cannot confirm Frank's statement that some rubbers contain resins which are converted during vulcanisation into sulphur compounds insoluble in acetone. On the other hand, he has almost invariably found the amount of matter soluble in acetone greater after, than before, vulcanisation.—J. K. B.

India-Rubber; Behaviour of — towards Solvents.

G. Fendler. *Gummi-Zeit.*, 1904, 19, 41—45.

OWING to the very contradictory statements made by different writers, the author undertook the determination of the solubility of some 26 varieties of india-rubber, in ether, light petroleum spirit, benzene, and, in one or two cases, in chloroform and carbon bisulphide. The results, which are given in the table overleaf, show that Weber's statement that rubber is absolutely insoluble in ether, is quite incorrect, ether being, on the contrary, a good solvent, in most cases equal, or nearly equal, to petroleum spirit and benzene. Some kinds of rubber are not entirely soluble in any of the rubber solvents, but contain insoluble rubber-like constituents which swell up but do not dissolve. These insoluble portions vary in their behaviour towards the different rubber solvents, and their presence can only be accounted for by assuming them to be either oxidation-products formed during the coagulation process, or the result of the action of sulphurous acid given off by the burning Urikuri nuts. Further experiments by the author show that petroleum spirit dissolves the least highly oxidised constituents of india-rubber, and probably could be used for a rough separation, as in fat analysis for the separation of oxidised from non-oxidised unsaturated fatty acids. The portions insoluble in petroleum spirit but soluble in benzol contained, in two out of three cases, considerably more oxygen than the portion soluble in petroleum spirit. Closely associated with these partially oxidised constituents of india-rubber is the question whether they are estimated as pure rubber by Harries' "nitrosite" method (this J., 1903, 875), and from the analyses given it appears they are, so long as they retain their rubber-like condition. The author concludes that the valuation of rubber by precipitation from its solution in petroleum spirit and estimation of the resins is the only reliable method, and the nitrosite method is only applicable to the analysis of vulcanised rubber, where the amount of rubber substance originally used is required to be known. Chemical analysis of rubber alone is not sufficient, but should go hand in hand with technical valuation, as the conditions resemble those in the valuation of wine, which cannot be determined by mere analysis.

Brand.	Percentage of Pure India-Rubber precipitated by Alcohol from the following solutions of India-Rubber after filtration through Glass Wool.					Insoluble Residue.	Resin.
	Ether.	Petroleum Spirit.	Benzol.	Chloroform.	Carbon Disulphide.		
	Per Cent. (a) 46·67 (b) 47·20	Per Cent. (a) 33·00 (b) 35·30	Per Cent. (a) 33·11 (b) 35·11	Per Cent. (a) 77·41 (b) 77·41	Per Cent. (a) 64·38 (b) 64·38		Per Cent.
Para (crude)	89·00	94·17	93·11	..	..	Swollen	2·09
La. Para (crude)	95·56	93·44	93·44	..	..	Swollen	4·55
Para (washed)	97·00	96·00	96·44	..	..	Swollen	2·67
" sheet	68·09	67·40	89·32	..	..	Swollen	3·66
Negrohead (crude)	75·54	80·55	93·15	..	..	Swollen	7·10
Santos (Mangabeira), Rio-Platten from Brazil (crude)	85·50	93·84	92·00	..	..	..	2·50
							6·34
La. Manicoba (crude)	81·60	80·07	78·20	{ (a) 81·16 (b) 80·87 }	82·27	{ Partially swollen Greater part heterogeneous. }	3·66
Manicoba (washed)	95·04	93·25	92·06	..	..	..	5·20
Westind. scraps (crude)	93·83	96·75	95·42	..	..	..	3·36
Mexican scraps (crude)	85·50	89·50	89·22	..	..	..	11·67
Guatemala (sheets) (crude)	80·33	80·25	78·11	..	..	Heterogeneous	17·54
Madagascar (crude)	87·92	92·51	92·50	..	..	..	8·00
Calabar (crude)	64·75	65·25	67·96	..	..	Heterogeneous	29·83
Ordinary red ball rubber, Upper Congo (crude)	90·33	93·07	89·67	..	..	..	4·83
Root rubber, Mozambique (crude)	47·80	46·00	50·78	..	..	"	2·25
Kamerun clusters (crude)	90·00	94·83	93·67	..	..	"	4·60
Red Congo Thimbles (crude)	54·75	57·92	58·11	..	..	Heterogeneous	3·01
Isangi (Africa) (crude)	89·20	89·60	89·75	..	..	{ Partially swollen heterogeneous. }	6·15
Manihot Glaziovii, East Africa (crude)	80·00	81·77	79·20	84·00	..	Swollen	7·06
Manihot Glaziovii Togo (crude)	84·00	85·33	85·39	85·00	..	Greater part swollen.	6·20
La. Borneo (crude)	81·75	89·50	89·22	..	..	Heterogeneous	8·66
Borneo (crude)	69·75	70·92	72·23	..	..	..	24·64
Ceylon-Para (crude)	72·00	86·86	96·67	..	..	Swollen	2·00
Bissao (Portuguese Guinea) (crude)	88·17	92·16	90·50	..	..	Heterogeneous	4·80
La. Java	94·00	94·34	92·00	..	..	"	5·20

By heterogeneous is meant containing foreign matter, such as sand, dirt, &c.

—J. K. B.

Rubber, particularly Crude Rubber; New Methods for the Analysis of — G. Fendler. XXIII., page 1117.

XIV.—TANNING; LEATHER, GLUE, SIZE.

Quebracho Extract; Detection of Adulteration in — T. Koerner and P. Düllberg. XXIII., page 1115.

FRENCH PATENTS.

Leather and Skins; Process for Cleaning and Colouring — J. Kjeldsen. Fr. Pat. 343,931, June 13, 1904.

THE use is claimed of a solution of stearic acid in benzene or other similar hydrocarbon, to which is added a concentrated aqueous solution of an alkali or alkaline carbonate or a solution of alkaline earths or bicarbonates of the same. Or the benzene may be mixed with an excess of ammonia together with a suitable colouring matter and some lanoline.

—F. D. T.

Skins and Leather; Process for Treating Partially Prepared — H. W. Southworth. Fr. Pat. 344,441, June 22, 1904.

THE skins which have been previously cleaned, are plunged into water containing a small quantity of ferrous sulphate. They are then allowed to drain and afterwards immersed in a bath composed of glycerin and a solution of about one part of acetate of alumina to from four to eight parts of water. After they have been partially dried, they are rubbed with a mixture of castor-oil and alcohol and piled on each other until they are completely saturated. Finally a mixture of oil, beeswax, or gum lac, to which a little rubber may be added, is allowed to thoroughly penetrate the material.—F. D. T.

XV.—MANURES, Etc.

Lime; Determination of — in presence of Phosphoric Acid. K. K. Järvinen. XXIII., page 1114.

ENGLISH PATENTS.

Fertiliser, and Process for Making the same — N. van Laer, Burton-on-Trent. Eng. Pat. 3170, Feb. 9, 1904.

PRESSED yeast is mixed with from 2·5 to 10 per cent. of sodium or potassium nitrate and allowed to liquefy and ferment for about 24 hours. Other salts of potassium, sodium, magnesium, phosphorus, or ammonium may be used to cause liquefaction. During fermentation from 5 to 10 per cent. of soot is added and afterwards the pasty mass is treated with about 10 per cent. of mineral superphosphates together with from 15 to 40 per cent. of finely-powdered unslaked lime. The final product is air dried, if necessary, disintegrated and screened.—W. P. S.

Insect-killer adapted for use as a Manure. R. and M. Jenkner and J. Pleyl. Eng. Pat. 19,068, Sept. 3, 1904. XVIII. C., page 1109.

FRENCH PATENT.

Glycerin; Extraction of — from Industrial Liquids containing it, and notably from Distillery Residues. E. A. Barbet. Fr. Pat. 344,036, April 16, 1904. XVII., page 1108.

XVI.—SUGAR, STARCH, GUM, Etc.

Sugar Cane Fibre; Hydrolytic Products of — C. A. Browne, jun. XIX., page 1110.

Syrups of Acid Fruit Juices; Inversion of Sucrose in — H. Quériault. J. Pharm. Chim., 1904, 20, 407—408.

THE author has observed that sucrose is inverted less quickly in the syrups of acid fruit juices than in a sugar solution containing an equal or even less percentage of added tartaric acid. The following table gives the results obtained by diluting 10 grms. of syrup to 100 c.c., and observing the rotation in a 200-mm. tube.

Syrups.	Acidity as Tartaric Acid.	Differences between the original and the observed deviation.			
		After 1 week.	After 2 weeks.	After 1 month.	After 2 months.
Tartaric acid (Codex).	Per Cent. 1'000	0 40	1 20	2 53	5 56
Raspberries.....	0'736	0 6	0 18	0 32	1 0
Black currants.....	0'792	0 6	0 12	0 22	0 32
Mulberries.....	0'835	0 4	0 16	0 8	0 12
Cherries.....	0'576	0 2	0 4	0 8	0 16
Quinces.....	0'463	0 2	0 2	0 4	0 6
Tartaric acid....	0'500	0 18	0 32	1 4	2 34

He suggests that the presence of albuminoid matters in fruit juices may exercise a retarding action on the inversion.

—L. J. de W.

Sugar Solutions ; Boiling-Points of — H. Claassen.
Z. Ver. deutsch. Zuckerind., 1904, 1159—1169.

Two series of determinations were made. In the first solutions of pure sugar, and syrups such as occur in the manufacture of beet sugar, were brought to boiling in a steam-jacketed copper pan of 22 cm. diameter and 25 cm. height by passing in well-dried live steam. The concentration corresponding to each temperature of ebullition was ascertained by taking out samples and estimating the total solids and rotatory power. The second series of experiments was made upon factory syrups only, in the full-scale vacuum-pan of a sugar works. For the tables of figures obtained, the original must be consulted; they go to prove that the increments by which the boiling points of saccharine solutions rise with concentration, are the same in vacuo and under atmospheric pressure.—W. A. C.

Defecation [Sugar] ; Electrolytic — H. Claassen.
Z. Ver. deutsch. Zuckerind., 1904, 1157—1158.

AGAINST the view of Gurwitsch (this J., 1904, 993), the author maintains that electrolytic methods have no prospect of competing successfully with existing processes of defecation. In the treatment of molasses by the stromtia or lime process the products are (1) a bright syrup from which a high yield of sugar is directly obtained, and (2) the whole of the non-sugar originally present, which is worked up into whatever is most profitable, e.g., cyanides at the present time. By Gurwitsch's electrolytic process (this J., *ibid*), on the other hand, only about one-half of the non-sugar is recovered, whilst the purified syrup has only 75 degrees of purity, and leaves about 50 per cent. of the original molasses as an uncrystallisable syrup. The proposed sale of the latter as an edible syrup is deprecated on account of the mercury with which it has come into contact. Finally, the initial cost of an electrolytic plant would certainly not be less than that incurred in the rival process.—W. A. C.

Dextrose ; Indicator for Use in the Quantitative Determination of — with Fehling's Solution. C. Griggi.
XXIII., page 1117.

UNITED STATES PATENT.

Milk Sugar ; Process of Making — S. R. Kennedy,
Philadelphia. U.S. Pat. 772,517, Oct. 18, 1904.

MILK is concentrated to a density between 11° and 27° B., the condensed product is subjected to a temperature approaching 32° F. until the sugar crystallises, the sugar crystals are removed in a centrifugal apparatus, and washed with alkaline water at a temperature below 50° F. The salts of the milk may be recovered by evaporation of the washing liquors and recrystallisation.—J. F. B.

FRENCH PATENTS.

[Sugar Extraction] Protection of Beetroots and Sugar Cane from the Action of the Air during Treatment.
G. Tauer. Fr. Pat. 338,999, Aug. 24, 1903.

THE process of reducing the beetroots or sugar canes to chips, pulp, &c., is conducted in a closed vessel, from which

the air is expelled by an inert gas at a suitable temperature (e.g., the gases from the boiler flues). The material is also conveyed to the diffusion vessels, presses, or heaters in a closed apparatus in an atmosphere of inert gas, which precludes the entry of air at any stage.—J. F. B.

Sugar Juice ; Preparatory Treatment of Beetroots or Sugar Cane for the Extraction of —, in order to Increase the Yield. G. Tauer. Fr. Pat. 339,000, Aug. 25, 1903.

THE saccharine material (beetroot or cane) is reduced to pulp or ground, and before extraction of juice, is heated by means of waste flue-gases (previously cooled to a temperature preferably not below 90° C.) to between 50° and 100° C. (preferably 85° C.) before the juice is extracted therefrom. The gases which have served for heating the reduced material may be subsequently utilised for protecting the latter from the action of the air during conveyance to the heaters and during the process of reduction.—J. F. B.

XVII.—BREWING, WINES, SPIRITS, Etc.

Barley ; Methods and Apparatus for Testing the Germinative Capacity of — H. Wichmann. Allgem. Zeits. f. Bierbrau. und Malzfab.; through Woch. f. Brau., 1904, 21, 686—688.

THE author has carried out a series of comparative tests on the germinative power of different barleys, determining (a) the germinative energy, i.e., the proportion of corns which had germinated after 72 hours; (b) the total germinative capacity. The value of the different methods and apparatus was judged by the magnitude of the results obtained and by the closeness with which the germinative energy approached the total germinative capacity. Only three of the apparatus tested were in any degree satisfactory: these were: Aubry's germinating box, with a germinating bed consisting of filter-paper on a glass plate, 500 corns per test; Schönjahn's apparatus, with a germinating bed of sea-sand on a perforated porcelain plate, 100 corns per test; Schönfeld's germinating funnel, without germinating bed, 1,000 corns per test. Of these, Schönjahn's apparatus is perhaps the most reliable, but it does not quite answer all requirements, on account of the small number of corns tested, and it would be necessary to perform five determinations simultaneously for testing one sample. It may, however, be relied on as a convenient means for controlling results yielded by other apparatus in important cases. Schönfeld's germinating funnel was found to be very simple and generally satisfactory, giving maximum values within 72 hours, but in one case of a freshly harvested barley it gave very deficient results as compared with two other apparatus.—J. F. B.

Barley-Germination Tests : Comments on Wichmann's Article (see preceding abstract). F. Schönfeld. Woch. f. Brau., 1904, 21, 688—689.

IN reply to Wichmann's criticisms, the author points out that with all germinating apparatus small errors in manipulation readily lead to incorrect results; this is most marked in the case of over-steeping. As the result of hundreds of tests on different barleys, carried out with the glass germinating funnel, the author prescribed a period of five hours' steeping. With sound barleys this period scarcely ever leads to over-steeping, but it may easily do so in the case of freshly-harvested, unmaturing barleys, especially with small-corned and rain-damaged samples. The defect of over-steeping, which causes a very large decrease of the germinative capacity, may easily be remedied by curtailing the time of steeping to 3—4 hours, and any operator can detect such errors due to excessive steeping by conducting two parallel tests, one with three hours' and the other with five hours' steep. In this way experience is gained by which the period of steeping may be judged in accordance with the constitution of the barley, so as to give the maximum germinative values. With due discretion in this particular, Schönfeld's germinating funnel will be found

to give results in three days, which are almost identical with the total germinative capacity.—J. F. B.

Malt Analysis. H. A. Hunick. J. Amer. Chem. Soc., 1904, 26, 1211—1200.

THE author has examined the effect of variation in the moisture content of malt on the yield of extract. Some of the results obtained with Wisconsin malt are shown in the following table. The fine meal was obtained by grinding the malt in a coffee-mill, whilst the three coarse grades were obtained by grinding in a Seck mill set at the marks indicated.

Percentage of Moisture.	Percentage of Extract on Dry Material.			
	Fine.	0.	25.	50.
4.45	74.28	73.12	71.23	53.63
6.32	73.91	72.13	69.99	70.02
7.99	74.26	71.66	68.58	43.31
9.69	73.91	70.83	65.47	37.69
11.45	73.71	69.41	60.70	30.76
13.22	74.28	63.06	55.15	25.47

The decrease of yield of extract with increase of the moisture content appears to be due principally to the grains becoming softer and less brittle, whereby the quality of the ground product is affected, and probably also to increased dilution of the charge in the determination of the extract. The influence of stirring on the yield of extract was also examined, and it was found that with coarsely-ground products, the yield is perceptibly decreased when the mash is not stirred at all, and that stirring at intervals of five minutes does not give such high results as stirring every minute. It is essential that the mash be well stirred while the temperature is being raised. The author also discusses the influence on the yield of extract of the luck of uniformity of the samples of malt, the formation of dust during the grinding, and the rate of grinding.—A. S.

Yeast Ferments; Some —. K. Shiga. Z. physiol. Chem., 1904, 42, 502—507. Chem. Centr., 1904, 2, 1827.

THE author found that in the course of the auto-digestion of the expressed juice of yeast, the amount of xanthine increases continuously, whilst that of guanine decreases, even if it be added in the free state. No definite rule could be observed with regard to adenine and hypoxanthine, the amounts of these bases increasing and decreasing in an irregular manner during the course of the digestion. The expressed juice of yeast is stated to contain an *arginase*, which produces ornithine from arginine, but does not attack guanidine.—A. S.

Yeasts; Fermentation and Respiration of Different Kinds of — in Roll Cultures. M. Leschtsch. Centr.-Bl. f. Bakter. u. Parasitenk., 1904, 12, 649—656; 13, 22—28. Chem. Centr., 1904, 2, 130.

By observing the separation of carbon dioxide in roll cultures in different media (beer wort, "plum decoction," and saline solutions containing peptones and sugar), the various races of yeast may be divided into three classes, typical representatives of which are *Sacch. cerevisia*, *Sacchar. Pombe*, and *Sacch. membranifaciens*. With *Sacch. cerevisia* in the first two days, nearly equal amounts of carbon dioxide are disengaged, whether the surrounding atmosphere be one of hydrogen or of air. Afterwards, the production of carbon dioxide ceases at an earlier period in hydrogen than in air; if the hydrogen be replaced by air, an increased evolution of carbon dioxide is caused for a short time. *Sacch. Pombe* produces more carbon dioxide in air than in hydrogen. In air, the curve representing the evolution of carbon dioxide rises sharply, and subsequently sinks rapidly. In hydrogen, on the other hand, the rise and fall of the curve are very gradual. Replacement of the hydrogen by air causes an increased production of carbon dioxide for a short time. *Sacch.*

Pombe does not propagate so well as *Sacch. cerevisia* in an atmosphere free from oxygen. *Sacch. membranifaciens* is a typical aerobe. The amount of carbon dioxide evolved is much less in hydrogen than in air. If the hydrogen be replaced by air, the amount of carbon dioxide produced increases rapidly, but the increase is not maintained.

—A. S.

Yeast; Researches on the Respiration and Respiratory Enzymes of —. J. Grüss. Z. ges. Brauw., 1904, 27, 686—692, 699—704, 721—724, 734—739, 752—754, 769—772.

Determination of Glycogen.—The amount of glycogen was calculated from the iodine absorption value of the yeast before and after storage in the moist state for 48 hours at 28°—30° C, during which period the glycogen was used up. The differences between the two iodine values were standardised in terms of glycogen by the acid hydrolysis of the yeast at the two stages in question. Average results indicated that 1 per cent. of iodine is equivalent to 3.2 per cent. of glycogen.

Formation and Disappearance of Glycogen in relation to the Respiratory Quotient.—The yeast plasma is capable of producing and storing up glycogen in equal quantities during the fermentation of either dextrose or fructose under similar conditions. The glycogen is therefore built up, not directly from the sugar, but from the atomic groupings into which the sugar must first be split up by the *zymase* or other fermentative enzyme. The respiration experiments showed that the store of glycogen is first converted by hydrolysis into dextrose, and that this latter, serving as the respiratory material proper, is then resolved into carbon dioxide and varying quantities of alcohol.

Respiratory Enzymes: Oxydase and Hydrogenase.—When the yeast cells are in a state of vigorous fermentative activity, i.e., when the sugar molecule is being broken up with the greatest intensity, the oxydase reaction ["tetra-base" reaction] is suppressed. This stage corresponds with the formation of glycogen and with a considerable rise in the respiratory energy, i.e., the quantities of oxygen absorbed and carbon dioxide exhaled in unit time. These conditions exist at a maximum after the yeast has been fermenting for some time out of contact with the air. Since the disappearance of the oxydase reaction takes place when the respiratory energy is relatively high, it is probable that the reducing substance which interferes with this reaction attracts the oxygen through the cell wall more strongly than the "tetra-base." It is suggested that the reducing substance in question is nascent hydrogen and that it is produced from the constituent groups of the glucose [hydrolysed glycogen] by the action of a hydrating ["wasser-addierendes"] enzyme, e.g., according to an equation of the type $\text{CH}(\text{OH}) + \text{H}_2\text{O} = \text{CO}_2 + 4\text{H}$. This hydrogen is not liberated, but combines with any reducible substances present, or, in default, with the oxygen fixed by the oxydase, thereby masking the reaction of the latter. In absence of air this nascent hydrogen would tend to form alcohol according to the equation $2\text{CH}(\text{OH}) + 4\text{H} = \text{C}_2\text{H}_5(\text{OH}) + \text{H}_2\text{O}$. The hypothesis explains the increase of the respiratory energy after fermentation, the occurrence of direct reducing actions such as reduction of sulphur or colouring matters, the absence of the oxydase reaction after fermentation, the fluctuations of the respiratory quotient, the disappearance of the glycogen and the reappearance of the oxydase reaction when the glycogen has been used up or when fermentative activity is inhibited by the addition of sodium chloride. If it be valid, the addition of a reducible body such as sulphur should result in a decreased yield of alcohol, which appears to be the case. The author shows that the enzyme which is the anti-enzyme of the oxydase and which produces nascent hydrogen by hydration is identical with the enzymes described by other authors under the names of "philothion," "catalase," and "hydrogenase." Whether it can be assumed to be identical with Buchner's *zymase* depends on whether the fermentative action can be proved to take place in two such stages as are illustrated in the above equations or whether it is a direct specific breaking up of the sugar molecule into carbon dioxide and alcohol.—J. F. B.

Yeast; Some Constituents of — O. Hinsberg and E. Roos. *Z. physiol. Chem.*, 1904, 42, 183—192. *Chem. Centr.*, 1904, 2, 1062—1063. (See this J., 1903, 920, 1012).

In the method previously given by the authors (*loc. cit.*) for the preparation of yeast-fat, the alcoholic extract of the yeast was evaporated, and the residue dissolved in a solution of caustic soda or sodium carbonate and extracted with ether. It is now found that only by using sodium carbonate can a fat rich in lecithin be obtained; when caustic soda is used the fat undergoes considerable decomposition. For medicinal purposes, the yeast-fat containing lecithin is to be preferred, as the lecithin "contains active unsaturated acids."—A. S.

Glycerin; Formation of — during Alcoholic Fermentation. W. Seifert and R. Reisch. *Centralbl. Bakt.*, 1904, 12, [2], 574. *Z. Spiritusind.*, 1904, 27, 441.

The authors have studied quantitatively the formation of glycerin during the alcoholic fermentation of grape must. The formation of glycerin is at a maximum in the earlier stages, when the degree of fermentation and of yeast propagation is greatest; towards the end of the fermentation, hardly any glycerin is produced. There is no connection between the formation of glycerin and that of alcohol, but the presence of large quantities of alcohol hinders considerably the formation of glycerin. Glycerin is not a direct fermentation product, but a product of metabolism of the yeast, and the amount of it formed depends upon the vital energy and nature of the yeast. Substances which have the power of increasing the vital energy of the yeast, e.g., sugar, at certain concentrations, cause also an increase in the formation of glycerin.—A. S.

Fusel Oils; Origin of — O. Emmerling. *Ber.*, 1904, 37, 3535—3538.

MANY experiments with various races of yeast and several different fermentable carbohydrates showed that, under normal conditions of alcoholic fermentation, only infinitesimal quantities of fusel oil are produced, so long as the fermenting wort remains pure. On the other hand, many bacteria possess the property of forming higher alcohols, especially butyl alcohol, from carbohydrates. Amongst these may be mentioned *Granulobacter butylicum*, *B. orthobutylicus* and the "amylic" ferment of Péreire and Guignard (this J., 1902, 558 and 1090). Bacteria which are especially active in this kind of fermentation occur on the skins of potatoes. The production of fusel oil takes place only under anaerobic conditions. The most suitable carbohydrates appear to be starch and cane-sugar, especially in the unhydrolysed state. For instance, 1,000 grms. of boiled potatoes and 50 grms. of wheat grist, suspended in 3 litres of water with a little chalk, and infected with potato peel, yielded 25 c.c. of insoluble fusel oil; 500 grms. of molasses, containing 48 per cent. of sugar, yielded 19 c.c. of fusel oil under the same conditions. The fermentations were carried out anaerobically for four weeks at 37° C. Hydrogen, carbon dioxide, and butyric acid were obtained as by-products. The same materials saccharified by malt or inverted yielded only 1.8 and 1.5 c.c. of fusel oil respectively. The products consisted of propyl, butyl, and amyl alcohols with only traces of ethyl alcohol. The author found that the addition of nitrogenous materials, such as decomposed yeast, was not favourable to the production of fusel oil.—J. F. B.

Fine Spirits. K. Windisch. *Z. Untersuch. Nahrungs u. Genussmittel*, 1904, 8, 465—505.

The author details the examination of samples of cherry brandy, plum brandy, apple brandy, quince brandy, currant brandy, and grape brandy, including the determination of the higher, insoluble fatty acids, formic acid, acetic and butyric acids, and the free and combined hydrocyanic acid; also the determination of fusel oil in various kinds of raw spirit, over 100 samples of "cognac" (mean 0.339 per cent.), 33 samples of rum (0.234 per cent.), 7 of arrack (from 0 to 0.47 per cent.), 36 of cherry brandy (mean 0.457 per cent.), 81 of plum brandy (0.313 per cent.), 12 of grape

brandy (0.95 per cent.), and 20 of apple brandy (0.527 per cent.). In addition the paper deals with judging fine spirits on the basis of chemical analysis, and the limitation of the various appellations for these spirits, such as "cognac," "cherry brandy," &c. The author opposes the view that the presence of furfural is an indication of purity and *vice versa*, nor does he agree with the proposed "coefficient of impurity" as a criterion, since the amount of impurities will depend on the nature of the raw material, and the method of distillation. Dealing with the improvement of spirits, he advocates distillation accompanied by slight dephlegmation, this having been found to furnish superior products to the old method of distilling with direct fire heat. Still more can be done by properly controlled fermentation with pure yeasts. It is considered desirable to express analytical results in grms. per 100 c.c., the fusel oil values, obtained by the Roese method, being multiplied by 0.814 for that purpose. The volatile acids and esters, fusel oil and aldehydes, should be referred to 100 c.c. of absolute alcohol to make the results independent of the actual alcohol content of the spirits. Owing to the practice of adding sweet wines to spirits, the volatile acids and total acidity should be determined, the latter by titration with alkali in presence of phenolphthalein (for white spirits) or violet litmus (for coloured); the volatile acids by steam distillation, and titration with phenolphthalein as indicator, the results in both cases being expressed as acetic acid. The esters are determined by boiling for half an hour with excess of alkali under a reflux condenser, and titrating the residual free alkali. In the case of spirits containing extract, sugar or colouring matters, which would falsify the titration by consuming alkali, the esters must be separated by distillation. The results should be expressed in terms of ethyl acetate.—C. S.

Alcoholometric Tables for each Integral Percentage by Weight, and for each Degree of the Hydrogen Thermometer from 15° to 22°. E. W. Morley. *J. Amer. Chem. Soc.*, 1904, 26, 1185—1193.

TABLES are given showing the true specific gravity of mixtures of alcohol and water for each integral percentage by weight (from 0 to 100), for each degree of the centigrade hydrogen thermometer from 15° to 22°, according to the results of Mendeléeff. The specific gravity given is the quotient of the weight of the liquid divided by its volume, increased by the correction for displaced air.—A. S.

Yeast Extract in Meat Extract; Detection of —

M. Wintgen. *XXIII.*, page 116.

Boric Acid [in Wine, &c.]; Detection of —

L. Robin. *XXIII.*, page 1113.

ENGLISH PATENTS.

Fertilizer [from Yeast] and Process for Making the same. N. van Laer. *Eng. Pat.* 3170, Feb. 9, 1904. *XV.*, page 1104.

FRENCH PATENTS.

Beer or Malt Extract; Nutritive —. J. Moberts. *Fr. Pat.* 343,896. June 11, 1904.

BEER brewed with pure malt is mixed with 0.4 kilo. of crystallised sugar-candy per 100 kilos. of malt, or 2 grms. per litre of beer. The wort is boiled for 60 hours and subjected to a slow fermentation for nine days.—J. F. B.

Phlegms, Wines and Fermented Washes; Continuous, Direct Rectification of —. A. Baudry. *Fr. Pat.* 338,992. Aug. 19, 1903. (See also this J., 1904, 725.)

THE fermented liquor is fed into a first distilling column which communicates above with a separatory column and below with a second distilling column. The light volatile impurities from the first distilling column rise into the separatory column, where they are concentrated and separated from any alcoholic vapours; the purified alcoholic liquor descends from the first to the second distilling column, the alcoholic vapours from which are passed to a rectifying column. The heavy "tail" products from the

rectifying column descend into a third distilling column where they are freed from alcohol and discharged.

—J. F. B.

Phlegms, Wines and Fermented Washes; Continuous, Direct Rectification of — A. Baudry. First Addition, dated Jan. 6, 1904, to Fr. Pat. 338,992, Aug. 19, 1903. (See preceding abstract.)

THE improved arrangements provide for the return of some of the impure alcoholic liquors from the lower plates of the rectifying column to the first distilling column in which the phlegms are first distilled.—J. F. B.

Wine; Automatic Conversion of Newly Fermented into Wine suitable for Bottling. E. Faller. Fr. Pat. 343,999, June 15, 1904.

THE wine or other alcoholic beverage is caused to flow from the cask through a worm immersed in a water-bath, in which it is heated to any desired temperature. The precipitated matters are removed by passing the wine from the heating worm through a filter, from which it flows through a worm immersed in cold water, in which it is cooled to a temperature suitable for bottling. It is important that this worm should be so narrow that the whole of its section is filled with the liquid, in order to avoid any loss of alcohol or "bonquet" by volatilisation.—J. F. B.

Glycerin; Extraction of from Industrial Liquids containing it, and notably from Distillery Residues. E. A. Barbet. Fr. Pat. 344,036, April 16, 1904. ✓

THE liquid is concentrated to about 40°–42° B. and treated with powdered lime in the proportion of, say, 1 to 1½ kilos. to 1 kilo. of the syrup, from which, if necessary, crystals have been previously separated by means of a turbine. The porous mass is then treated with alcohol of as high a strength as possible (95–96 per cent.), and the alcoholic extract evaporated by means of a current of hot air or gas. The residual mass ("vinassate") from the alcoholic extraction forms a good manure. (See this J., 1903, 502; 1904, 1035.)

—C. A. M.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(A).—FOODS.

Oils and Fats; Uses and Applications of — J. Lewkowitsch. XII., page 1098.

Boric Acid [in Milk]; Detection of — L. Robin. XXIII., page 1113.

Watered Milk; Detection of — A. E. Leach and H. C. Lythgoe. XXIII., page 1116.

Yeast Extract in Meat Extract; Detection of — M. Wintgen. XXIII., page 1116.

ENGLISH PATENT.

Centrifugal Separators (for Cream, &c.). H. Austin, Birmingham. Eng. Pat. 23,091, Oct. 26, 1903.

THE plates of the separator are formed with curved upper edges, forming weirs over which the milk to be separated flows, and pockets in which the separated cream collects. A number of short tubes extend from these pockets, inwardly, into vertical slots formed in the central pillars and up which the separated cream flows. In this way the cream does not come into contact with the inflowing stream of milk, which flows up the central aperture of the plates and over the curved edges between the tubes.—W. H. C.

Milk; Treatment [Condensation] of — [Preparation of Milk Sugar]. S. R. Kennedy, Philadelphia, U.S.A. Eng. Pat. 20,291, Sept. 20, 1904.

SEE U.S. Pats. 770,900 and 772,517 of 1904; this J., 1904, 996 and page 1103.—T. F. B.

Food and other Substances; Sterilisation of —

A. Schröder, Berlin. Eng. Pat. 12,113, May 27, 1904.

THE process described consists in adding peroxides to the article, such as foods, water, milk, butter, &c., to be preserved, and decomposing the peroxides by means of carbon dioxide (under pressure), carbonates, bicarbonates, or acid phosphates. The peroxides employed are those of calcium, magnesium, or sodium. For decomposing the two former, calcium or magnesium acid phosphates may be used with or without the aid of carbon dioxide. The articles before or after treatment may be subjected to a temperature of 40° to 50° C.—W. P. S.

FRENCH PATENTS.

Foodstuffs; Process for Preserving — [with Trioxymethylene]. A. Foelsing. Fr. Pat. 343,944, June 13, 1904.

SEE Eng. Pat. 13,669 of 1904; this J., 1904, 878.—T. F. B.

Preservatives for Foodstuffs, Articles of Use, and the like. Deutsche Conservierungs-Ges. für Nahrungs-und Genussmittel. Fr. Pat. 344,101, June 17, 1904.

SEE Eng. Pat. 18,428, 1903; this J., 1904, 832.—W. P. S.

(B).—SANITATION; WATER PURIFICATION.

ENGLISH PATENTS.

Paving Blocks from Towns' Refuse. W. Weaver. Eng. Pat. 22,042, Oct. 13, 1903. IX., page 1091.

[Water] Filters; Aeration of —, and *Apparatus for use in connection therewith*. F. Candy, London. Eng. Pat. 23,772, Nov. 3, 1903.

IN the case of a pressure filter, such as is described in Eng. Pat. 5242, 1898 (this J., 1899, 391), air is forced into the upper part of the filter by means of an air-pump or fan. The suction-pipe of the pump may be either (1) connected to the bottom of the filter, (2) open to the air, (3) connected to an air-sterilising chamber, or (4) to an ozone-producing apparatus. Instead of forcing air through the filter, the pump may be employed as a suction-pump at the bottom of the filter, this alternative process being also applied to open filters. In place of a pump or blower a closed tank may be used provided with means for admitting and withdrawing water therefrom and connected to the filter by a pipe. By the introduction of water to this tank, air is forced into the filter, and, when the tank is emptied, air is drawn through the bed. The object of the process is to remove water mechanically retained by the filter-bed, and it is applied after the filter has been washed or cleansed from suspended matter.—W. P. S.

Sewage or other Liquid; Apparatus for Distributing — J. B. Alliot, Nottingham, and W. D. Scott-Moncrieff, Staines. Eng. Pat. 24,838, Nov. 14, 1903.

FOR distributing sewage uniformly and intermittently over a filter-bed, two vehicles are provided, each comprising a trough-shaped receptacle mounted on wheels, with mechanism causing the trough to tilt gradually as it travels to the end point of a pair of inclined rails. The two vehicles are connected together by chains and travel reciprocally down and up the two inclined tracks. The sewage supply is situated at the highest point of the track and supplies the vehicles alternately; one vehicle having been filled, it travels down the track distributing its sewage contents uniformly in its path as the trough tilts over. During the upward course the trough is tilted back into an upright position ready to receive a fresh charge.—J. F. B.

Sewage; Filtering and Purifying — S. Barwise, Duffield, Derbyshire. Eng. Pat. 25,480, Nov. 23, 1903.

THIS is a process for assisting and increasing the natural action of filter-beds. For this purpose air is drawn in at the top of the filter-bed by means of a fan (or other mechanism) fixed on a pipe coming from the bottom of the bed. From this pipe, branch pipes and subsidiary branch pipes, terminating in perforated earthenware saggets,

extend to all points of the floor of the filter. The sewage is supplied to the filter by a revolving spreader and leaves by an effluent channel, the effluent reaching the latter through suitably placed trapped pipes. The sides of the filter-bed are composed of air-tight material and the air and effluent pipes may be combined or separate.—W. P. S.

Bacteria Beds and the like; Apparatus for Use with —.
H. L. Doulton and R. J. Pleace, London. Eng. Pat. 26,466, Dec. 3, 1903.

THE first part of the invention relates to an apparatus for the automatic delivery of sewage to two or more bacteria beds in succession. A chamber has two or more outlets at its bottom, each outlet communicating with a separate filter-bed. Above these outlets is fixed a revolving plate provided with one opening, the latter, as the plate revolves, passing over the outlets. An automatic siphon is fixed in a second chamber and discharges into the first chamber. As the sewage rises in the second chamber it raises a floating ball, which, in its turn, by means of a ratchet wheel, shafting, and cog-wheels, causes the plate in the first chamber to revolve. The opening in the plate is thus brought over a separate outlet between each discharge of the siphon. The second apparatus claimed consists of a device for the automatic discharge of sewage from a chamber after it has been retained some pre-arranged period. The sewage flows into a chamber containing a siphon in which air is compressed and from which the air must be released before the siphon acts. The top of the pressure-chamber of the siphon is connected by a pipe to a valve in a second chamber. This valve is operated by a floating ball and lever, the ball being raised by allowing part of the sewage to flow into this second chamber through a regulated valve. The ball-valve is so arranged that it opens quickly. A small siphon is provided for emptying the second chamber and discharges into the first siphon.—W. P. S.

UNITED STATES PATENTS.

Water; Method of Purifying —. T. Jones, Acme, Tex. U.S. Pat. 773,395, Oct. 25, 1904.

To remove gypsum and carbonates dissolved in water, the patentee adds milk of lime to the latter, and then to the residual water a solution of orthosilicate of soda of the consistency of syrup.—W. P. S.

Sea or Hard Water; Composition for Purifying —.
A. Gutensohn, Southend, Eng. U.S. Pat. 773,494, Oct. 25, 1904.

THE composition consists of rosin, prepared by repeated heating and cooling, dissolved in a solution containing sodium carbonate, sodium hydroxide and sodium silicate, mixed with a solution of zinc hydroxide in sodium hydroxide.—W. P. S.

FRENCH PATENTS.

Sewage and other Refuse; Treatment of —. J. L. F. Garrigou. First Addition, dated June 16, 1904, to Fr. Pat. 340,740, Feb. 26, 1904. (This J., 1904, 833.)

THE modification described consists in heating the refuse, &c., without the addition of chalk or other materials, in order to directly obtain the ammonia contained in the refuse.—W. P. S.

Sewage; Apparatus for [Electrically] Treating —.
W. J. Schweitzer. Fr. Pat., 344,192, June 21, 1904.

SEE U.S. Pat. 763,026 of 1904; this J., 1904, 758.—T. F. B.

Ammonia from Waste Waters; Process for Extracting —. R. Schilling and C. Kremer. Fr. Pat. 344,420, July 1, 1904.

SEE Eng. Pat. 14,966 of 1904; this J., 1904, 947.—T. F. B.

Water; Clarification of —. J. E. Vial. Fr. Pat. 344,174, June 21, 1904.

THE turbid water is allowed to settle in a long tank or basin, having its greatest depth at the middle and being

shallow at each end. The sides of the tank slope inwards to form a channel along the bottom. A series of walls or partitions are placed at certain distances apart along the channel. The upper edge of each partition is just below the surface of the water, whilst the lower edge reaches to within a short distance of the bottom of the tank. The entrance to the tank consists of a horizontal slab over which the water flows in a shallow layer.—W. P. S.

(C.)—DISINFECTANTS.

Mould Fungi; Influence of some Salts and Monatomic Alcohols on the Development of —. K. S. Iwanoff. Centralbl. Bakteriöl., 1904, 13, [2], 139. Chem.-Zeit., 1904, 28, Rep., 310.

THE experiments were carried out with four different nutrient solutions:—Solution G: Wehmer's modification of Henneberg's solution of N/30 L-asparagine, N/6-dextrose, N/30-potassium dihydrogen phosphate, and N/100-crystallised magnesium sulphate: Solution N: solution G with the asparagine replaced by ammonium nitrate: Solution S: solution G with the dextrose replaced by saccharose: Solution DG: solution G with the amount of dextrose doubled. The fungi used were *Amylomyces* 8, *Aspergillus niger*, *Mucor spinosus*, *Mucor racemosus*, *Oidium lactis*, and *Trichothecium roseum*. The substances of which the action was examined comprised the sulphates of magnesium, zinc, cadmium, manganese, nickel, cobalt and copper, mercuric chloride, methyl, ethyl, propyl, normal and secondary butyl, isopropyl, isobutyl, iso-amyl and allyl alcohols, trimethylcarbinol and amylen hydrate. It was found that in the case of the metals of Mendelejeff's second group, the poisonous action on the fungi increases with the atomic weight: $Mg < Zn < Cd < Hg$. Of the other metals manganese was the least poisonous in solution N, and then cobalt, nickel, copper, in the order given. The poisonous action of the metallic salts varies according to the nature of the nitrogenous food supplied to the fungi; for example, in solution G, the order is $Mn < Cu < Co < Ni$. The different action exhibited by the same salt in different nutrient solutions is due partly to chemical reactions, and partly to physiological causes. The nature of the nutrient material containing carbon has also an influence on the action of the salts; this is likewise due partly to chemical and partly to physiological causes. In the cultures of *Mucor spinosus* the metallic salts produce coloured crystalline precipitates. With regard to the action of the alcohols, the poisonous effect increases with the length of the carbon chain in the case of primary, monatomic alcohols. With the butyl alcohols the poisonous action increases in the order, trimethylcarbinol, secondary normal butyl alcohol, primary isobutyl alcohol, primary normal butyl alcohol. Primary propyl alcohol is more poisonous than the corresponding secondary alcohol, primary iso-amyl alcohol more than the corresponding tertiary alcohol, and allyl alcohol more than normal butyl alcohol.—A. S.

ENGLISH PATENTS.

Alkaline Chlorides and Oxychlorides; Preserving the Strength and Keeping Powers of Solutions of —, employed for Bleaching, Disinfecting, Separation of Metals, and other such like Purposes. G. J. Atkins and Oxychlorides, Ltd. Eng. Pat. 25,972, Nov. 27, 1903, VII., page 1088.

Insect-Killer adapted for Use as a Manure. R. and M. Jenkner and J. Pleyl, Floridsdorf, Austria. Eng. Pat. 19,068, Sept. 3, 1904.

POTASSIUM cyanide and other cyanogen compounds are found not to affect the growth of plants, whilst they destroy phyloxera and other parasites and insects. The insecticide-manure to which the present invention relates consists of a mixture of potassium cyanide and quicklime, also ammonium salts, and a decolorising agent, such as magnesium hydrosilicate, or alumina. The cyanogen compounds are used in the form obtained in the purification of coal-gas by the ferric oxide process.—T. F. B.

XIX.—PAPER, PASTEBOARD, Etc.

Sugar-cane Fibre; Hydrolytic Products of — C. A. Browne, jun. J. Amer. Chem. Soc., 1904, 26, 1221—1235.

THE author has studied the products obtained by the hydrolysis of sugar-cane fibre with dilute caustic soda solution. 200 grms. of purified fibre obtained by washing finely-cut bagasse successively with water, 2 per cent. hydrochloric acid, and again with water, were digested for eight hours with 3 litres of a 5 per cent. solution of caustic soda. The residual pulp was washed several times with small quantities of cold water and the washings added to the caustic soda solution. The pulp was then further purified by washing with hot water till free from alkali, and finally with strong alcohol. From the caustic soda solution the cane-gum was precipitated by alcohol, and purified by treatment with an alcoholic solution of hydrochloric acid, followed by washing with alcohol and then with ether. On hydrolysis with 4 per cent. hydrochloric acid, the cane-gum yielded *l*-xylose and *l*-arabinose, the latter being isolated in the form of its benzylphenylhydrazine. Xylan and araban make up nearly 80 per cent. of the cane-gum; the presence of galactan could not be detected. From the filtrate from the cane-gum, lignin was precipitated by dilute sulphuric acid after expelling the alcohol. After purification the lignin formed a brown-coloured powder, which, when treated with chlorine, yielded a product apparently identical with the lignone chloride, $C_{15}H_{18}Cl_2O_6$, prepared by Cross and Bevan from jute and other fibres. The acid filtrate from the lignin yielded acetic acid when distilled in a current of steam. The cellulose obtained by digesting the cane fibre with caustic soda amounted, in the dry condition, to only 42 per cent. of the original fibre. This low yield of cellulose, compared with the result obtained by Cross and Bevan's chlorination method, is due to the solvent action of the alkali, especially on the pith. The following figures show the relative resistance of the different tissues of the cane to various chemical treatments:—

	Pith.	Fibro-vascular Bundles.	Rind.
	Per Cent.	Per Cent.	Per Cent.
Cellulose by chlorination (Cross and Bevan).	49.00	50.00	51.09
Cellulose by treatment with 1.25 per cent. sulphuric acid and 1.25 per cent. caustic soda solution (Weende).	42.86	48.64	54.78

These results have an important bearing upon the utilisation of cane-fibre for paper-making, since a chemical treatment necessary for the proper preparation of the rind would result in a large loss of pith. Drewsen (U.S. Pat. 731,290 of 1903; this J., 1903, 376) has patented a process by means of which this loss is avoided, the pith being separated from the sugar-cane, corn-stalks, &c., before digestion. The pith is not fibrous, and has no felting properties, but paper prepared from it is stated to possess the quality and strength of parchment. The cellulose prepared from the cane-fibre by digestion with caustic soda yielded dextrose on hydrolysis with sulphuric acid.

The yields of the different products, calculated to the fibre free from protein, ash, fat, &c., were:—Cellulose (including oxycellulose), 55; xylan, 20; araban, 4; lignin, 15; and acetic acid, 6 per cent. The sugar-cane fibre resembles very closely in composition the pithy stalks of maize, both being allied to the cereal straws, a distinguishing characteristic of which group is a cellular complex low in cellulose and high in pentosans.—A. S.

Printing Papers; Production of Dust by —

X. Wochenbl. f. Papierfab., 1904, 35, 3270—3271.

THE production of dust on low-grade printing papers, which clogs the type and makes the printing on the high-speed

"news" machine almost impossible, is due either to imperfections in manufacture or to inferior raw material. As regards manufacture, the continual fall in the price of "news" makes it imperative that the paper-machines should be run at ever-increasing speed. When a mill thus increases its output it is very seldom provided with more beating engines, nor is the construction of the paper-machine altered by increasing the length of the wire and the number of the drying cylinders. Under these conditions the increased output is only obtained at the expense of the quality of the paper; the short-fibred stuff has to be beaten "free," it does not have time to felt properly, and the paper is dried far too quickly. Paper prepared thus will nearly always make a large quantity of dust on the printing machine. As regards raw material, "news" paper generally contains 20 per cent. of chemical wood-pulp, and 80 per cent. of mechanical wood-pulp, and is loaded with about 20 per cent. of clay. The quality of the clay is of great importance, it should have a fatty feel and should suspend well in water; gypsum and the cheap, "thin" qualities of clay are quite unsuitable as loading materials for printing papers. But the quality of the paper is chiefly dependent on that of its main constituent, the mechanical wood-pulp. A cheap, free-ground quality of wood-pulp, ground with coarsely sharpened stones, cannot be made into good paper whatever the care bestowed on the beating; it will also frequently prove dearer than a wet-ground pulp, higher in price, because it causes more loss and will not retain the clay. The best sort of pulp is prepared by stones which have a fine grain and are delicately sharpened; above all, the wood employed should not be old and dry, but as fresh as possible. The quality of the paper can best be tested by pressing the palm of the hand on the reel as it is being wound up; if the hand become covered with a layer of fine white dust, composed mainly of wood-fibres, the paper will be quite unfit for high-speed printing.

—J. F. B.

UNITED STATES PATENTS.

Paper-Making; Means for Dissolving Size for — B. Kniffler, Milwaukee, Wis. U.S. Pat. 771,986, Oct. 11, 1904.

THE apparatus consists of a large water-tank, and two small tanks provided with steam coils. The size is placed in one of the small tanks and is heated by the coil, the steam from which is utilised for disintegrating and discharging the size, by means of an injector, into a pipe dipping below the surface of the water in the large tank. During its passage through this pipe, the size is intimately mixed with atomised hot water discharged through a second injector fitted to the second small heating tank.

—J. F. B.

Paper; Process for Making — Moisture or Grease Proof J. Kitzee, Philadelphia. U.S. Pat. 772,103, Oct. 11, 1904.

PAPER is treated superficially with a mixture of nitric and sulphuric acids, in such a manner as to make the surface soluble whilst leaving the interior unchanged. The treated surface is then subjected to the action of a solvent.

—J. F. B.

Pulp Washer or Condenser. H. G. Turner, Montreal. U.S. Pat. 772,192, Oct. 11, 1904.

THE apparatus consists of a vertical, cylindrical tank in which is situated a vertical, cylindrical strainer capable of being rotated. The space between the walls of the tank and the strainer is divided horizontally into a number of superposed, annular compartments, communicating with each other by openings which are disposed in different angular positions, each opening being separated from the next one by means of transverse partitions. The pulp is fed in at the bottom of the tank and is caused to travel upwards through all the compartments; a series of doctors is provided, one in each compartment, and pressed against the screening cylinder by springs, so that when the cylinder rotates, the pulp is agitated and scraped off the screen, whilst being subjected to the action of jets of water. —J. F. B.

FRENCH PATENTS.

Cellulose Xanthate; Purification of — for the Preparation of Viscose. Soc., Franc. de la Viscose. Second Addition, dated June 14, 1904, to Fr. Pat. 334,636, Aug. 14, 1903.

In place of using alkali or alkaline-earth sulphite solutions for toughening crude cellulose xanthate, it is found more advantageous to use alkali or alkaline-earth bisulphites, either alone, or in conjunction with aluminium sulphate, alkali chloride, sulphate, &c. (See this J., 1904, 75 and 501.)—T. F. B.

Celluloid Non-inflammable; Process for Rendering — G. E. Woodward. Fr. Pat. 344,048, May 25, 1904.

CELLULOID is rendered non-inflammable by incorporating with it, for each kilo. of celluloid, 1.5 kilos. of fish glue, 400 grms. of gum arabic, 100 grms. of gelatin, and 40 grms. of colza oil.—T. F. B.

Celluloid or Nitrocellulose: Rendering Non-inflammable; Process for — W. C. Parkin. Fr. Pat. 344,501, July 1, 1904. Under Internat. Conv., Dec. 23, 1903.

CELLULOID or nitrocellulose may be rendered incombustible by incorporating with it aluminium chloride, strontium chloride, magnesium chloride, and calcium chloride. Two parts of celluloid dissolved in 3 parts of acetone are added to a solution of 1 part of one (or a mixture) of the above salts in 2 parts of methyl alcohol. The solvents are distilled off, and the celluloid obtained in powder form suitable for working up in the usual manner.—T. F. B.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Esterification; New Method of —, for Organic Acids. A. Werner and W. Seybold. Ber., 1904, 37, 8658—3661.

By the action of dimethyl sulphate on aqueous solutions of the alkali salts of organic acids, good yields of the methyl esters of the acids can be obtained. The reaction proceeds according to the equation: $-R.COOX + (CH_3)_2SO_4 = R.COCH_3 + CH_3.X.SO_4$. 5 grms. of the acid are treated with a slight excess of N/1 alkali, and about 2 molecular proportions of dimethyl sulphate are added. If the mixture be shaken continuously, the reaction is complete in half-an-hour. The excess of dimethyl sulphate is decomposed by heating the product on the water-bath, and after cooling, the ester is separated from the free acid by adding excess of alkali. The methyl esters of acetic, isovaleric, stearic, 2,4,6-tribromobenzoic, 2,4,6-trinitrobenzoic, β -methoxy- α -naphthoic, and β -methoxy- β -naphthoic acids have been prepared by this method. The method is stated to give good yields in cases where the usual method of esterification with the corresponding alcohol fails, e.g., in the preparation of esters of 2,4,6-tribromo-, and 2,4,6-trinitrobenzoic acids.—A. S.

Quinine; Refining of — C. Martinotti and G. Castellini. Boll. Chim. Farm., 1904, 43, 529—536. Chem. Centr., 1904, 2, 1154—1155.

AFTER a description of the known methods for the separation of quinine sulphate from the amorphous and resinous substances accompanying it, the authors propose a new process based on the following facts:—(1) The resinous, uncrystallisable substances remain in solution in perfectly neutral and in acid liquids. (2) On adding alkali to liquors poor in quinine, but still contaminated by amorphous substances, the latter are precipitated first, separating as a viscous magma. For the separation of quinine from the mother-liquors, the authors recommend working with the basic quinine hydrochloride, $C_{20}H_{21}N_2O_2 \cdot HCl \cdot 2H_2O$ converting it into the dihydrochloride, $C_{20}H_{24}N_2O_2 \cdot 2HCl$.—A. S.

Essential Oils; Treatment with Sulphuric Acid for the Identification of — M. Duyk. XXIII., page 1116.

Patchouli Oil; Composition of — H. v. Soden and W. Rojahn. Ber., 1904, 37, 8353—3355.

PATCHOULI oil, freshly prepared from the leaves, was resolved by distillation into four fractions of equal weight, having sp. grs. 0.946, 0.964, 0.984, and 1.002 (at 15° C.), and optical rotations -44° , -52° , -64° , and -70° respectively. The last two fractions consisted mainly of patchouli alcohol, with small amounts of another liquid sesquiterpene alcohol. The first two fractions, which contained the sesquiterpenes and also the aromatic constituents of the oil, were repeatedly fractionated, distillates of like sp. gr. and rotatory power being mixed together and further fractionated. Finally, four products were obtained, viz., small quantities of the aromatic substances, larger quantities of patchouli alcohol (these two were not examined further), a fraction (A) of sp. gr. 0.93—0.94 and $\alpha_D = -50^\circ$, and a fraction (B) of sp. gr. 0.93—0.94 containing both, feebly, dextro- and levo-rotatory substances. Fractions A and B were treated with alcoholic potash, washed, and repeatedly fractionated as above. The chief component of fraction A was a new liquid sesquiterpene, colourless, of sp. gr. 0.9335 (at 15° C.), b. pt. 264° — 265° (750 mm.), α_D (20° C.) $= -58^\circ 45'$; it absorbs bromine, hydrobromic acid, and hydrochloric acid (the latter forming a liquid hydrochloride); it somewhat resembles cedrene (this J., 1897, 555) as regards physical constants, but is not identical with it. Fraction B yielded mainly another sesquiterpene, of sp. gr. 0.930 (15° C.), and b. pt. 273° — 274° ; $\alpha_D = +0^\circ 45'$. It forms with hydrochloric acid a liquid hydrochloride. Cadinene, found by Wallach (Annalen, 1887, 81) in patchouli oil, was not detected in either fraction.—T. F. B.

Birch Leaves; Essential Oil of — Haensel's Report, Oct. 1904. Apoth.-Zeit. 1904, 19, 854.

THE leaves of *Betula alba* yield 0.049 per cent. of an olive-green oil, which solidifies at normal temperatures, from the presence of an unidentified crystalline constituent. The oil is fluid at 35° C., at which temperature its sp. gr. is 0.9074; it is optically inactive in 10 per cent. alcoholic solution at 30° C.; acid value, 99; saponification value, 146.7. It is wholly soluble in absolute alcohol only on warming. By filtering the oil from the stearoptene, 57 per cent. of a thickly fluid oil was obtained with an acid reaction: sp. gr. 0.8723 at 20° C. Its acid and saponification values are very close to those of the original oil.—J. O. B.

Raspberries; Essential Oil of — Haensel's Report, Oct. 1904. Apoth.-Zeit., 1904, 19, 854.

By distilling raspberry press-marc, a small quantity of essential oil was obtained, of a greenish colour and acid reaction, having an intense raspberry aroma, sp. gr. 0.8883 at 15° C.; $\alpha_D = +2.8^\circ$; saponification value, 193; saponification value after acetylating, 215; solubility in 80 per cent. alcohol 1:30.—J. O. B.

Burdock Leaves; Essential Oil of — Haensel's Report, Oct. 1904. Apoth.-Zeit., 1904, 19, 854.

AIR-DRIED burdock leaves yielded 0.0285 per cent. of a dark brown oil, resembling that obtained from burdock root in taste and odour, entirely fluid at 30° C.; not entirely soluble in 96 per cent. alcohol. The stearoptene deposited at ordinary temperatures is probably palmitic acid, similar to that isolated from the essential oil of the root. This leaf oil has the sp. gr. 0.9562 at 20° C.; acid value, 76; saponification value, 91.5. On re-distilling, 39 per cent. of brown, faintly acid, rectified oil was obtained, readily soluble in 96 per cent. alcohol, not wholly soluble in 80 per cent. alcohol: sp. gr. 0.9407, at 20° C.; acid value, 18; saponification value, 70; $\alpha_D = +0.28^\circ$ in 20 per cent. alcoholic solution for 25 mm. tube.—J. O. B.

White Peruvian Balsam; Constituents of — H. Thoms and A. Biltz. Allgem. Oester. Apoth. Verein, 1904, 943. Apoth.-Zeit., 1904, 19, 1732.

WHITE Peruvian balsam contains myroxocerin, free cinnamic acid, a crystalline body, m. p. 270° C., myroxol, cinnamic esters of cinnamyl and propyl alcohols, and probably a

hydrocarbon. White Peruvian balsam does not contain benzyl alcohol nor peruvial, which are present in ordinary dark balsam of Peru.—J. O. B.

Bergamot Oil and other Oils of the Citrus Series; Note on — H. E. Burgess and Th. H. Page. Chem. Soc. Proc., 1904, 20, 181-182.

Acetic acid, octylene, pinene, camphene, and limonene have been identified as constituents of a specimen of pure oil of bergamot. The pungency of the first fractions of this oil on distillation is accounted for by the presence of acetic acid, which was also found in smaller quantities in lemon oil, and is probably present in the other oils of this series. The octylene found in lemon oil was identical with that in bergamot oil, for both gave butyric acid on oxidation with potassium permanganate. It is probably a normal constituent of the citrus oils. A second phenylurethane isolated from the terpineol fraction of distilled oil of limes melts at 132° C., is more soluble than that obtained from ordinary terpineol, crystallises in tufts of needles, and gives on hydrolysis an oil with an intense odour of distilled oil of limes.

Formic Acid; New Reaction of — E. Comanducci. XXIII., page 1116.

Aromatic Esters; Electrolytic Reduction of — C. Mettler. XI.A., page 1096.

Atropine; Contributions to the Knowledge of Alkaloid Reactions.—III. C. Reichard. XXIII., page 1116.

Yeast; Some Constituents of — O. Hinsberg and E. Roos. XVII., page 1107.

ENGLISH PATENT.

Saccharin; Production of — A. Ashworth, Bury, Lancs. Eng. Pat. 25,481, Nov. 23, 1903.

IF, in the oxidation of *o*-toluenesulphonamide to saccharin, an alkaline earth permanganate be used in place of an alkali permanganate, the yield is found to be much improved. A mixture of 100 lb. of *o*-toluenesulphonamide, 23 lb. of slaked lime, and 200 gallons of water is heated to 70°-80° C., and 180 lb. of calcium permanganate (98 per cent.) dissolved in 50 gallons of water is added gradually with stirring; the precipitate of manganese compounds is removed by filtration, and the saccharin recovered from the filtrate in the usual way.—T. F. B.

UNITED STATES PATENT.

Ureide of Dialkylacetic Acid and Process of making same. E. Fischer, Berlin, and J. von Mering, Halle a/Salle. Assignors to the Firm of E. Merck, Darmstadt, Germany. U.S. Pat. 773,251, Oct. 25, 1904.

SEE Eng. Pat. 1944 of 1903; this J., 1903, 880.—T. F. B.

FRENCH PATENT.

Dialkylbarbituric Acids; Process for Preparing — Farbenfabr. vorm. F. Bayer und Co. Fr. Pat. 343,976, June 14, 1904. Under Internat. Conv., Oct. 21, 1903.

SEE Eng. Pat. 22,967 of 1903; this J., 1904, 76.—T. F. B.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Photographic Plates; Action of certain Substances on — [in the Dark]. J. Blass and P. Czermak. Phot. Ind., 1904, 223. Chem.-Zeit., 1904, 28, Rep., 332.

THE action of a variety of substances on photographic plates in the dark is described. Brown wrapping paper is the most active, followed by other kinds of paper, wood, straw, shellac, leather, silk, and cotton in the order given; glass and metals (other than zinc) and most minerals and inorganic substances had little or no action. Photographic

films and films removed from their support were not sensitive to any substances. Thin sheets of metal, glass, quartz, or mica also prevent the action of the substances on glass plates. Sheets of gelatin, through which blue or violet rays can pass, have no influence on the action, but yellow sheets of gelatin completely prevent it. (See also Russell, this J., 1904, 998, and von Aubel, this J., 1904, 560.)—T. F. B.

ENGLISH PATENT.

Photographic Plates and Films. J. H. Smith, Zürich, Switzerland. Eng. Pat. 19,940, Sept. 16, 1904. Under Internat. Conv., Sept. 17, 1903.

COMPOUND plates or films for use in multi-colour photography are produced by superimposing on a support of glass, paper, &c., the requisite number of sensitive films, each one being separated from the adjacent one by a thin layer of collodion or celluloid. After exposure, a temporary support, coated with some adhesive, is pressed on the uppermost film, which can then be transferred to a permanent support; the collodion or celluloid layer is dissolved away, and the film is then treated in the usual way. All the other sensitive films, with the exception of the lowest one, are removed in the same manner, a series of negatives suitable for colour-work being thus obtained by a single exposure.—T. F. B.

UNITED STATES PATENT.

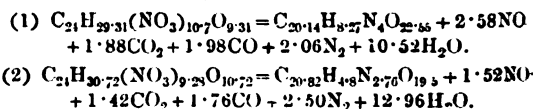
Photograph on Linen, and Process of making same. O. Fulton, Chiswick, and W. M. Gillard, Twickenham, England. U.S. Pat. 773,384, Oct. 25, 1904.

SEE Eng. Pat. 11,219 of 1903; this J., 1904, 622.—T. F. B.

XXII.—EXPLOSIVES, MATCHES, Etc.

Nitrocellulose; Decomposition of — below the Temperature of Ignition. A. Scaposechnikow and M. Borisow. J. russ. phys.-chem. Ges., 1904, 36, 836-841. Chem. Centr., 1904, 2, 1030.

THE authors represent the decomposition at 150° C. (in the course of 20-25 hours) of two specimens of nitrocellulose (mixed with quartz sand) containing 13.25 and 12 per cent. of nitrogen, respectively, by the equations:—



If the nitrocellulose be not mixed with sand, the decomposition is more complete and proceeds more rapidly. The brown pitch-like residue is readily soluble in acetone. The decomposition at 135° C. proceeds in the same manner qualitatively as at 150° C. The limit of temperature beyond which nitrocellulose is unstable and has a tendency to readily decompose is 137°-138° C.—A. S.

ENGLISH PATENTS.

Nitroglycerin; Apparatus for Weighing Substances such as — G. E. Arnold. Eng. Pat. 26,575, Dec. 4, 1903. XXIII., page 1113.

Explosive Compounds and the Manufacture thereof. M. S. Talbot, Durban, Natal. Eng. Pat. 26,978, Dec. 9, 1903.

AN explosive mixture of the following composition is claimed: Potassium chlorate, 56 parts; camphor, 4 parts; castor oil, 4 parts; burnt umber, 8 parts; manganese dioxide, 4 parts; and potassium bichromate, 12 parts. It is said to evolve very little smoke on explosion.—T. F. B.

Explosives of the Nitrate of Ammonia Group; Process for the Manufacture of — R. Haddan, London. From J. Führer, Vienna. Eng. Pat. 4699, Feb. 25, 1904.

SEE Fr. Pat. 341,633 of 1904; this J., 1904, 882.—T. F. B.

FRENCH PATENTS.

Powders [Artillery, Sporting and Mining]; Manufacture of — J. Luciani. Fr. Pat. 339,022, Sep. 8, 1903.

THE explosive in the form of sheets is passed through a machine consisting of two cylinders travelling at the same rate of speed. The upper cylinder has a design of any required form engraved on it in relief. The distance between the cylinders is regulated by a screw of fine pitch. By this means cuts or indentations can be made in the sheet to any desired depth, and with a given thickness of sheet the rate of combustion of the powder can be varied as may be required.—G. W. McD.

Nitrated Hydrocarbons [Explosives] and Process for Manufacturing the same. A. Hough. Fr. Pat. 343,907, June 11, 1904. Under Internat. Conv., June 13, 1903.

SEE U.S. Pat. 751,076 of 1904; this J., 1904, 385.—T. F. B.

XXIII.—ANALYTICAL CHEMISTRY,

APPARATUS, ETC.

Rotating Cathodes; Materials and Forms for — H. E. Medway. Amer. J. Science, Silliman, 1904, 18, [4], 180-182. Chem. Centr., 1904, 2, 1019. (See this J., 1903, 823; 1904, 952.)

FOR electrolytic determinations the author has recently used as rotating cathodes crucibles of silver and nickel, as also a plate-electrode of platinum. In the electrolysis of copper sulphate solution, accurate results were obtained with a silver crucible as cathode, but a nickel crucible was attacked both during the electrolysis and in the subsequent separation of the deposit. The deposited copper was detached from the silver crucible as far as possible by mechanical means, the last portions being removed by treatment with hot concentrated hydrochloric acid. The plate electrode recommended by Shepherd is not quite so satisfactory; the deposited metal does not adhere very firmly at the edges of the plate, and greater care is therefore necessary in washing it. Aluminium proposed by Hough is not a suitable material for a rotating cathode.—A. S.

Refractometer Scale for Use with Fats and Oils; Comparative — A. E. Leach and H. C. Lythgoe. J. Amer. Chem. Soc., 1904, 26, 1193-1195.

THE variation of the butyro-refractometer (Zeiss) readings of oils and fats with the temperature is not regular, and in order to obtain scale readings at temperatures other than that at which the determination has been made, it is necessary to transform the refractometer readings into the corresponding values for $[n]_D$, apply the correction for temperature, and re-transform into scale readings. The authors give a description and illustration of a slide-rule, by means of which readings may be obtained on the scale of the butyro-refractometer at different temperatures, without first transforming them into indices of refraction; readings in indices of refraction may be obtained at different temperatures without calculation; and readings on either refractometer scale may be readily transformed into readings on the other.—A. S.

ENGLISH PATENTS.

Gas Testing Apparatus. A. H. Lymn, London. Eng. Pat. 23,771, Nov. 3, 1903.

THE method of ascertaining the value of illuminating gas from the length of its flame, when burned under standard conditions, is not easily applied to the testing of non-luminous gases, such as water-gas, owing to the comparative invisibility of the flame. The patentee renders the length of the flame of such gases more apparent by placing in the flame a vertical rod or wire, or a ladder-like arrangement of horizontal wires of some material which readily becomes incandescent, or by inserting some substance, such as a salt of sodium, strontium, or the like, which is capable of rendering the flame readily visible.—H. B.

Weighing Substances such as Nitroglycerin; Apparatus for — G. E. Arnold, Faversham, Kent. Eng. Pat. 26,575, Dec. 4, 1903.

TO obviate the danger incurred by using ordinary weights in weighing nitroglycerin, an apparatus is described consisting of a pair of scales, one of the pans of which is designed to receive the substance for weighing, having fixed upon it a graduated receptacle, the other scale-pan being in the form of a graduated reservoir for a liquid such as water, and provided with an inlet and outlet. To use the apparatus, sufficient water is run into the liquid vessel until it attains the load corresponding to the weight of the nitroglycerin, &c. required, and the said substance is then introduced into its receptacle until equilibrium of the scale-pans is restored.—G. W. McD.

INORGANIC—QUALITATIVE.

Bismuth; Reactions of — C. Reichard. Chem.-Zeit., 1904, 28, 1024-1026.

IF to the solution of a bismuth salt, there be added preferably a fragment of brucine, or a concentrated solution of a brucine salt, a deep red colour is at once struck, which, on heating, becomes more intense. The colour is permanent only when the brucine is present in considerable excess. The same colour is yielded by a basic bismuth salt, provided a trace of hydrochloric acid is added to it before adding the brucine. None of the other metals of the hydrogen sulphide group gives a similar reaction save antimony, and the coloration in the case of antimony is developed only after heating, and does not appear at all in the cold. The bismuth reaction might possibly be confused with the well-known coloration given by nitric acid with brucine, but the latter fades to yellow on heating.

—J. T. D.

Boric Acid; Detection of [by means of Tincture of Mimosa Flowers]. L. Robin. Annales de Chim. Analyt., 1904, 9, 336-338.

In a Mixture of Salts.—The solution, rendered faintly alkaline with sodium carbonate, is boiled and filtered. A drop of tincture of mimosa flowers (this J., 1904, 561) is placed in a porcelain capsule, and a few drops of the filtrate are added, followed by sufficient hydrochloric acid to discharge the yellow tint. The mixture is then evaporated to dryness. In the presence of boric acid a yellow residue is obtained, which gives a red colour when treated with a few drops of a 10 per cent. solution of sodium carbonate. If no boric acid be present, the residue is greyish, turning yellow with the alkali carbonate solution. In the presence of mere traces of boric acid, bibulous paper moistened with a little of the tincture of mimosa and dried may be used instead of the tincture itself, as giving a more delicate reaction. In this case the filtrate, after acidifying with hydrochloric acid is evaporated to a small volume in a capsule and a band of the test paper 2 to 3 cm. long and 1.5 cm. wide is immersed in the concentrated liquid; evaporation is then carried to dryness. The dry paper then affords the above colour reactions.

In Wine, Cider, &c.—Ten or 15 c.c. of the liquid are evaporated to dryness, and the residue incinerated. The ash is taken up with 20 drops of water, the solution filtered, rendered very faintly acid with hydrochloric acid and then tested with the test paper as above.

In Milk.—Fifteen or 20 c.c. of milk are coagulated with two drops of acetic acid, the casein is filtered off, the filtrate neutralised with sodium carbonate, using phenolphthalein or mimosa tincture as the indicator, boiled, filtered, and evaporated to dryness. The residue is then incinerated and treated as in the case of wine.—J. O. R.

INORGANIC—QUANTITATIVE.

Sulphuric Acid in Commercial Acetic Acid; Determination of Free — C. Rossi. L'Industria chimica, 1904, 6, 253-254. Chem. Centr., 1904, 2, 1165-1166.

IN certain solvents, e.g., alcohol, formaldehyde, and especially acetone, the degree of ionisation of acetic acid is diminished to such an extent that the acid becomes indifferent to Methyl Orange. The degree of ionisation of

strong inorganic acids, on the other hand, is affected only slightly or not at all, by the solvents mentioned. It is possible, therefore, in presence of one of these solvents to determine directly the free sulphuric acid in commercial acetic acid by titration with alkali in presence of Methyl Orange. The amount of the solvent required, varies with the concentration of the acetic acid. The author used 6.5 c.c. of acetone with 10 c.c. of 40 per cent. acetic acid. The method is stated to give accurate results.—A. S.

Nitric Acid; Electrolytic Determination of—, with a Rotating Anode. L. H. Ingham. J. Amer. Chem. Soc., 1904, 26, 1251–1255.

THE electrolytic determination of nitric acid has been already studied by Vortmann (this J., 1890, 1066) and by Easton (this J., 1903, 1258). The author finds that the time can be materially shortened by using a rotating anode. The following conditions were found to be the most satisfactory:—25 c.c. of copper sulphate solution (containing 0.2533 grm. of metallic copper), 25 c.c. of "standard" sulphuric acid, 0.5 grm. of potassium nitrate, 4 ampères, 10 volts at the outset, or 17 volts at the end of the reduction, and the anode rotating at a speed of 230 revolutions per minute. The time occupied was 30 minutes. When the electrolysis was complete, the excess of acid in the electrolyte not neutralised by the ammonia produced, was titrated with "standard" ammonia solution, with litmus or Methyl Orange as indicator.—A. S.

Lime; Determination of—in presence of Phosphoric Acid. K. K. Järvinen. Z. anal. Chem., 1904, 34, 559–562.

IN the precipitation of solutions of calcium phosphate by ammonium oxalate, some lime always remains in solution, and some phosphoric acid always contaminates the oxalate precipitate. This is so whether the solution be simply treated with excess of ammonium oxalate, whether it be neutralised with ammonia after precipitation, or precipitated in acetic acid solution, or in acetic solution followed by neutralisation. Accurate results, however, are obtained in the following way:—To the solution, as free as possible from ammonium salts, ammonia is added till a permanent precipitate appears, and this is redissolved in the least possible quantity of hydrochloric acid. The liquid is heated to boiling, and poured very gradually into a mixture of ammonium oxalate and oxalic acid (say, 10 c.c. of N/1 oxalate and 5 c.c. of 2N-oxalic acid diluted to 50 c.c.). The calcium oxalate separates slowly in small crystals. When precipitation is complete 1 per cent. ammonia solution is very gradually added till the liquid is just alkaline. The precipitate is collected on the filter, washed, and treated as usual.—J. T. D.

Bauxite; Analysis of—, Taurel. Ann. Chim. anal. appl., 1904, 9, 323–327. Chem. Centr., 1904, 2, 1251–1252.

THE presence of titanate acid frequently exerts a disturbing influence in the analysis of bauxite. Leclère (this J., 1903, 926) observed that titanate acid is precipitated along with silica from formic acid solution, and the author makes use of this fact in the following method: 2 grms. of the bauxite are fused with 8–10 grms. of a mixture of equal parts of sodium and potassium carbonates, until the melt ceases to effervesce. After cooling, the mass is dissolved in water and 20 c.c. of sulphuric acid of 66° B. and the solution evaporated till white fumes appear. The residue diluted with water and the silica filtered off. To determine the titanium dioxide and ferric oxide together, the filtrate is diluted to 1 litre, and 100 c.c. are run gradually into a mixture of 10 c.c. of ammonia and 50 c.c. of water. The ammoniacal solution is boiled, the precipitate filtered off, washed with boiling water, dissolved in hydrochloric acid, and reprecipitated with ammonia. The liquid is now treated with excess of formic acid, 1 grm. of sodium sulphite added or a current of sulphur dioxide passed through, and the whole boiled gently for one hour, whereby titanium dioxide is precipitated. Ammonium citrate or tartrate (8–10 times, the amount of alumina present) is then added, followed by excess of ammonia, and the iron is precipitated by ammonium sulphide.

The weight of the precipitate after ignition gives the amount of titanium dioxide and ferric oxide. For the separate determination of titanium, the filtrate from the silica is neutralised with ammonia, 10 c.c. of formic acid are added, and the solution is boiled gently whilst a current of sulphur dioxide is passed through for one hour. The titanate acid is filtered off, and the filtrate made up to 1 litre. In 100 c.c., the alumina and iron are precipitated by ammonia, and in another portion of 500 c.c., the iron is precipitated with ammonium sulphide in presence of ammonium citrate.

—A. S.

Iron; New Method for the Volumetric Determination of—, N. Tarugi and S. Silvatici. Boll. Chim. Farm., 1904, 43, 637–641. Chem. Centr., 1904, 2, 1341–1342.

THE method depends upon the titration of ferric chloride solution with potassium oxalate solution, in presence of thiocyanate as indicator. The iron salt is dissolved in concentrated hydrochloric acid, converted into the ferric condition by means of nitric acid or potassium chlorate, the excess of acid neutralised, and the filtered solution made up to a definite volume. An aliquot portion of the solution is then treated with a few drops of a N/10-thiocyanate solution and titrated with N/10-potassium oxalate solution (1 c.c. = 0.00186673 grm. of iron) till a characteristic yellowish-green colour is produced. The method is especially suitable for iron ores, as tungsten, silicon, iron and manganese can be determined in one and the same sample.—A. S.

Silicon in Iron and Steel; Determination of—, J. Thiel. Z. anal. Chem., 1904, 34, 552–553.

IN Drown and Shimer's method of determining silicon, the evaporation with sulphuric acid of the nitric acid solution of the metal absorbs much time; it must be done on the water-bath, or the risk of loss by bumping and spitting is very great. The author mixes a litre of strong sulphuric acid with an equal bulk of water, and after cooling, adds a litre of nitric acid (sp. gr. 1.40) and a litre of solution of ammonium chloride containing 240 grms. of the salt. To the weighed sample (1–2 grms.) in a 400–500 c.c. beaker he adds 50–70 c.c. of this mixture, covers with a watch-glass till solution is complete, and heats on wire gauze over a Bunsen flame. The liquid can be rapidly boiled down till fumes of sulphuric acid escape, without any danger of loss. After cooling, 100 c.c. of water are added and the solution is warmed, filtered, and the residue on the filter washed with hot water, then with warm dilute hydrochloric acid and finally with hot water; the filter is then placed moist in a platinum crucible, and dried and burnt off in the muffle.

—J. T. D.

Nitrogen in Iron and Steel; Rapid Determination of—, H. Braune. Oesterr. Z. Berg.-Hütt., 52, 491. Chem. Centr., 1904, 2, 1167.

THE author makes use of the colour reaction of ammonia with Nessler's reagent. 250 c.c. of water and 20 c.c. of a solution of alkali of an equivalent strength to hydrochloric acid of sp. gr. 1.124 are heated to boiling in an Erlenmeyer flask of 1500 c.c. capacity, provided with a rubber stopper, carrying a funnel and a tube connected to a condenser. 1 grm. of the iron or steel is dissolved in 10 c.c. of hydrochloric acid free from nitrogen compounds, and the filtered solution allowed to drop into the boiling alkali solution. The distillate is treated in a graduated tube, 35 mm. diameter, with a solution made by diluting 2 c.c. of the ordinary Nessler reagent to 10 c.c. The coloration produced is matched by one obtained from a known volume of a solution of ammonium chloride containing 0.038147 grm. per litre (1 c.c. = 0.01 mgrm. of nitrogen).—A. S.

Silver in Zinc; Determination of—and Silver-content of varieties of Commercial Zinc. K. Friedrich. Z. angew. Chem., 1904, 17, 1636–1644.

THE author has examined critically the methods of determining silver in zinc adopted by Karsten (solution in nitric acid and precipitation with hydrochloric acid); Malaguti and Durocher (oxidation, fusion of oxide with litharge and black flux, and cupellation); Kerl (fusion with excess of

lead and borax, and cupellation); Pufahl (solution in hydrochloric acid, fusion of residue with potassium cyanide and cupellation). The considerable solubility of silver chloride in various acid and saline solutions makes the first method valueless, and the loss of silver due to the reaction on it of potassium cyanide at high temperatures is an objection to Pufahl's method. Kerl's method is excellent in the case of zincs rich in silver, but for poorer alloys the large quantities which must be dealt with make it impracticable. A combination of Pufahl's and Kerl's methods, however, has proved most satisfactory with all classes of zinc, and the method is employed as follows:—The sample is granulated, and a suitable quantity (100–1000 grms., according to the expected richness) weighed off into a beaker (or beakers, in case of large amounts). A small quantity of hydrochloric acid is added, and when nearly saturated is poured off through a filter, and a second quantity poured on the sample; by this plan solution is greatly hastened. As soon as, or just before solution is complete, the whole residue is rinsed on to the filter and washed free from chlorides. The filter is placed in a crucible, dried and incinerated; to the residue 7.5–15 grms. of assay lead and some borax are added, and the whole heated to fusion. The button of alloy is then cupelled, alongside of a lead-silver button of about the same content, from which the unavoidable loss of silver by volatilisation is determined and allowed for in the usual way. The author has established by experiments on alloys of known composition that: (1) The cupellation method gives accurate results when zinc as well as lead is present in the alloy;

(2) If the excess of acid, after dissolving the zinc, be allowed to stand upon the residue, the silver gradually goes into solution: hence the direction to filter off before complete solution of the zinc; (3) In presence of hydrochloric acid or zinc chloride, very considerable quantities of silver chloride may be formed and volatilised during the incineration of the filter; hence the need for thorough washing of the residue. A table is given showing the amount of silver (in grms. per metric ton) in various specimens of commercial zinc.—J. T. D.

Gold; Determination and Separation of — Electrolytically. S. P. Miller. J. Amer. Chem. Soc., 1904, 26, 1255–1269.

In Cyanide Solution.—From 150 c.c. of a solution containing 1 gm. of potassium cyanide and 0.1291 gm. of gold, the latter was completely deposited in 2½ hours with a current of 1.8 volts. and $N.D_{100} = 0.02-0.04$ ampère during the first 1½ hours and then increased so as to maintain a voltage of 1.8; temperature, 55°–65° C. Gold was quantitatively separated from iron by working under the following conditions:—125 c.c. of solution containing 0.1286 gm. of gold, 0.13 gm. of iron and 3 grms. of potassium cyanide; current, 2.8–3 volts and $N.D_{100} = 0.13-0.36$ ampère; temperature, 65° C.; time, 2½ hours.

In Phosphate Solution.—Satisfactory conditions for the determination of gold and for its quantitative separation from cadmium, iron, zinc, cobalt, and nickel are shown in the following table:—

	Gold Present.	Foreign Metal Present.	Sodium Hydrogen Phosphate Solution (Sp. gr. 1.028.)	Phosphoric Acid. (Sp. gr. 1.35.)	Dilution.	Time.	Temperature.	Current, N.D ₁₀₀ .	Volts.
	Grm.	Grm.	c.c.	c.c.	c.c.	Hours.	° C.	Ampère	
Determination of gold	0.1193		20	5	125	3	60	0.03	1–2
Separation of gold from cadmium	0.1696	0.1107	20	5	125	4½	65	0.02	1–1.7
" " " iron....	0.1188	0.1100	40	10	150	5	62	0.02–0.08	1–2.7
" " " zinc....	0.1117	0.1150	30	6	150	2	67	0.04	2–2.5
" " " cobalt..	0.1237	0.1200	30	6	150–200	2	66	0.04	1.1–2
" " " nickel..	0.1236	0.1200	40	6	150	4	68	0.04–0.06	1–2.2

In Sodium Sulphide Solution.—10 c.c. of a solution containing 0.1276 gm. of gold chloride were treated with 50 c.c. of water, 15 c.c. of sodium sulphide solution (sp. gr. 1.19) were added, the liquid was warmed until it became clear, diluted to 150 c.c. and electrolysed at 61° C. with a current of 0.1–0.2 ampère and 2.4–3 volts. A quantitative yield of gold was obtained in 2 hours. Gold was also satisfactorily separated from arsenic, molybdenum and tungsten under similar conditions.—A. S.

Electrolytic Separations possible with a Rotating Anode. D. S. Ashbrook. J. Amer. Chem. Soc., 1904, 26, 1283–1290.

The author has examined whether Exner's method (th. J., 1903, 1150) of using a high current density and strong pressure with a rotating anode gives satisfactory results in the electrolytic separation of metals. It was found that copper could be quantitatively separated from aluminium, chromium, iron, and magnesium in sulphuric acid, nitric acid or phosphoric acid solution, from arsenic in ammoniacal or nitric acid solution, from cadmium and cobalt in nitric acid solution, from manganese and uranium in sulphuric acid or nitric acid solution, and from zinc in sulphuric acid or phosphoric acid solution. Cadmium was separated from aluminium, iron, magnesium, and manganese in sulphuric acid or phosphoric acid solution, from chromium in phosphoric acid solution, and from nickel in sulphuric acid solution. Silver was separated from aluminium, cadmium, chromium, cobalt, iron, lead, magnesium, manganese, nickel, and zinc in nitric acid solution. Mercury was quantitatively separated from aluminium and magnesium.—A. S.

UNITED STATES PATENTS.

Carbon Analysis; Method of — G. O. Seward, Holcomb Rock, Va., Assignor to Elmer and Amend, New York. U.S. Pat. 773,529, Oct. 25, 1904.

THE amount of carbon contained in a substance is determined by mixing it with an oxidising agent, and placing the mixture in a crucible suspended in a cylindrical glass vessel. The stopper of this vessel is pierced by gas-inlet and outlet tubes, by a funnel for the admission of liquid, and by the terminals of an electric generator, the ends of which dip into the mixture in the crucible. The gaseous products of combustion are passed through a carbon dioxide absorption apparatus; sulphuric acid is then added to the residue in the crucible through the funnel, and a current of purified air is passed through the contents of the crucible, driving the remaining products of combustion through the absorption apparatus.—T. F. B.

FRENCH PATENTS.

Hydrogen Contents of Gaseous Mixtures; Process for the Continuous Determination of the — Verein. Maschinenfabrik Augsburg und Maschinenbau. - Ges. Nürnberg, A.-G. Fr. Pat. 344,340, June 27, 1904.

SEE Eng. Pat. 15,706 of 1904; this J., 1904, 951.—T. F. B.

ORGANIC—QUALITATIVE.

Quebracho Extract; Detection of Adulteration in — T. Koerner and P. Düllberg. Deutsch. Gerber Zeit., 1904, 47, 115–126. Chem.-Zeit., 1904, 28, Rep., 328.

THE following method is proposed for the detection of adulteration of quebracho extract, especially by mangrove bark:—

The sample is dissolved in a small quantity of hot water, and alcohol is added to it when cool, until the solution ceases to become turbid. An equal volume of ether is added to precipitate the first fraction of the tannin, and a further quantity to precipitate the remainder. The two fractions are dissolved separately in alcohol, and again precipitated in two fractions by ether. The second of the two fractions in each case is subjected to elementary analysis. A pure quebracho extract should give 62–63 per cent. of carbon, or at any rate not less than 60 per cent.; a smaller percentage indicates adulteration (since mangrove bark gives only 56.15 per cent. of carbon when its alcoholic solution is precipitated with ether). Attempts to detect adulteration by determining the percentage of alkyloxy-groups present gave negative results.—T. F. B.

Watered Milk; Detection of — A. E. Leach and H. C. Lythgoe. *J. Amer. Chem. Soc.*, 1904, 26, 1195–1203.

THE authors find that the addition of water to milk perceptibly affects the degree of refraction of the serum. For determining the degree of refraction, the Zeiss immersion refractometer is recommended, but, the Abbé refractometer may also be employed. 100 c.c. of the milk at a temperature of about 20° C. are treated, in a beaker, with 2 c.c. of 25 per cent. acetic acid (sp. gr. 1.0350); the beaker is covered with a watch glass, and heated on the water-bath for 20 minutes at 70° C. It is then placed in ice water for 10 minutes, the solution filtered, and the degree of refraction of the clear filtrate determined immediately. Tables are given of: (1) readings on the immersion refractometer at temperatures of from 15° to 25° C. reduced to the corresponding values at 20° C.; and (2) refractive indices as read on the Abbé refractometer, corresponding to the scale readings on the immersion refractometer. Of the numerous samples of pure milk examined, the immersion refractometer reading of the serum was nearly always above 40° at 20° C., and in no case was it below 39°. The authors propose that milks of which the serum gives a reading on the immersion refractometer below 39° at 20° C. should be declared fraudulently admixed with water.

—A. S.

Yeast Extract; Detection of — in *Meat Extract*. M. Wintgen. *Archiv der Pharm.*, 1904, 242, 537–538.

WHEN albumins are salted out from meat extract by means of zinc sulphate solution, a clear filtrate is obtained; with yeast extract, however, the resulting filtrate is cloudy. 20 c.c. of freshly-prepared 10 per cent. aqueous solution of the extract are acidified with 2 c.c. of 20 per cent. sulphuric acid, and treated with excess of powdered zinc sulphate. After standing one or two days, the solution is filtered, only the first c.c. which runs through being returned to the filter. In the presence of yeast extract, or a mixture of 20 to 30 per cent. of yeast extract with meat extract, the filtrate will be turbid when first filtered.

—J. O. B.

Formic Acid; New Reaction of — E. Comanducci. *Estr. aus Rend. della R. Accad. delle Scienze, Fische e Matematiche di Napoli*, 1904. *Chem. Centr.*, 1904, 2, 1168.

FORMIC acid gives a characteristic yellow coloration with sodium bisulphite, and this reaction can be used for its detection (as small a quantity as 1 per cent.) in formalin, methyl alcohol, glycerin, and acetic acid. 2.5 c.c. of the liquid to be examined are diluted with an equal volume of water, 15 drops of a concentrated solution of sodium bisulphite (5 grms. in 5 c.c. of distilled water) are added, and the mixture is shaken and warmed. In presence of formic acid a yellowish-red coloration is produced.

—A. S.

Atropine; Contributions to our Knowledge of Alkaloid Reactions. III. C. Reichard. *Chem.-Zeit*, 1904, 28, 1048–1050. (See this J., 1904, 458.)

(1) WHEN atropine sulphate is warmed with mercurous nitrate, reduction takes place, and a highly characteristic

fragrant odour is produced, this odour being also produced when atropine is warmed with concentrated sulphuric acid. (2) If atropine sulphate is warmed with platonic chloride solution and sulphuric acid, metallic platinum separates out and the same fragrant odour is produced. With palladium chloride a similar reaction ensues. (3) A very characteristic reaction is with bismuth chloride. When a solution of this salt is mixed with atropine sulphate there is no change; but if concentrated sulphuric acid is added there is an immediate egg-yellow coloration. This reaction only takes place in the cold. (4) Sodium nitroprusside produces a reddish precipitate as with cocaine. (5) When atropine is ground with cane-sugar and hydrochloric acid, a fine rose-red colour is produced on warming. (6) When atropine sulphate is treated with arsenious or arsenic acid and sulphuric acid, rings of reduced arsenic are slowly formed. (7) If a drop of concentrated antimony trichloride solution be warmed with a trace of atropine sulphate, a bright green liquid is formed, permanent on further heating or evaporating. Stannous chloride does not change the green residue. This reaction can be used to distinguish between atropine and morphine. (8) When a trace of solid atropine sulphate is evaporated with dilute cobalt nitrate solution, a green coloration is produced. The most delicate and characteristic reaction of atropine is the odour produced with sulphuric acid.—F. S.

Essential Oils; Treatment with Sulphuric Acid applied to the Identification of — M. Dayk. *Les Corps gras ind.*, 1904, 31, 70–72. *Chem. Centr.*, 1904, 2, 1348–1349.

ACCORDING to the author, the Maumené test used in the examination of vegetable oils may also be applied to the identification of essential oils. 4 c.c. of *Paraffinum liquidum* are well mixed with 1 c.c. of the oil in a glass tube, then 2 c.c. of pure sulphuric acid are introduced at the bottom of the tube by means of a pipette, the tube is closed with a cork carrying a thermometer, the temperature observed, then the contents of the tube are well mixed, and the highest temperature attained is noted. The 4 c.c. of paraffin give a rise of 1° C. with 2 c.c. of sulphuric acid. The following values have been determined by the author:—Cymene, 4°; pinene, 36°; limonene, 26°; carvone, 26°; thymene, 13°; cedrene, 15°; anethol, 22°; thymol, 7°; safrol, 33°; carvacrol, 4.5°; apiol, 32°; eugenol, 27°; sandal-wood oil (a) 22.5°–33°, (b) 13°–18°; lemon-oil, 25°–26.5°; geraniol, 31.5°; menthol, 9°; linalool, 38°; eucalyptol, 22°; terpineol, 26°; santalol, 33°; cedar-wood oil, 16°–18°; peppermint oil, 13°–26°; eucalyptus oil, 24°; citral, 40°; anisaldehyde, 14°; benzaldehyde, 9°; menthone, 11°; citronellone, 33°; carvol, 30°; lavender oil, 33°–37°; and geranium oil, 24°–25° C.—A. S.

ORGANIC—QUANTITATIVE.

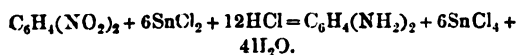
Fuels; Method and Apparatus for Determining the Heating Value of Gaseous and Liquid — H. Junker, Aachen, Germany. *Eng. Pat.* 18,487, Aug. 26, 1904. *Under Internat. Conv.*, Sept. 1, 1903.

AN improvement on the method described in *Eng. Pat.* 13,083 of 1892, requiring the measurement of only one magnitude. The fuel and cooling agent are supplied to the calorimeter in constant proportions, so that both may be made positively dependent on the time occupied in feeding. The heating value is then obtained directly from the difference of temperature of the cooling agent as it enters and leaves the calorimeter. The pressure of either the fuel or the cooling agent may be utilised for driving the meters through which the supply passes. By employing some form of differential thermometer or by keeping one of the two temperatures constant, the readings may be recorded directly in terms of the calorific value of the fuel.—J. F. B.

Benzene; Determination of — in *Illuminating Gas*. O. Pfeiffer. *Chem.-Zeit*, 1904, 28, 884–885.

THE author in 1899 (*J. f. Gasbeleucht.*, 42, 697) modified Harbeck and Lunge's method of determining benzene in

illuminating gas (conversion into dinitrobenzene by sulphuric-nitric acid) by using for the determination a measured volume instead of a stream of the gas, by which means several advantages are claimed. Whilst, however, the modified method is accurate with pure benzene, Korbuly has found it to give with illuminating gas much higher results than Harbeck and Lunge's method. This has been found to be due to another constituent of the gas, which forms, on treatment with the acid mixture, a bright yellow solid substance which is weighed with the nitrobenzene; this substance can be removed by means of animal charcoal, however, and when this is done the author's method gives results in accord with the methods of Harbeck and Lunge and of O'Neill. The author has introduced a further modification of the method, and now, instead of weighing the dinitrobenzene formed, titrates it by means of stannous chloride. An ordinary stoppered separating funnel of about 500 c.c. capacity (the exact capacity being in the first instance determined) is used. It is inverted, filled with the gas by displacement from above, closed, and the gas adjusted to atmospheric pressure by momentarily easing the stopper or opening the stopcock. Now 2 c.c. of the mixture of equal volumes of strong sulphuric and fuming nitric acids are introduced through the stem and stopcock, spread over the surface of the glass by inclining the funnel, and allowed to act for half an hour. The funnel is then turned right side up, and 30 c.c. of strong solution of sodium hydroxide are introduced. After all acid gases have been absorbed, hydrochloric acid is added till the liquid is faintly acid, and any carbon dioxide formed, is, as far as possible, expelled by shaking; then 50 c.c. of ether are added, the whole is well shaken for five minutes, and the ether decanted into a flask containing 1 gm. of well-dried potassium carbonate and half a gm. of animal charcoal. This treatment is repeated with a second 50 c.c. of ether, and the united ethereal extracts are shaken with the charcoal at intervals during several hours. The ether is then filtered into a 200 c.c. flask, the residue on the filter washed with ether, and the whole of the latter evaporated. To the residue about 10 c.c. of alcohol and exactly 10 c.c. of stannous chloride solution are added, the whole is heated for ten minutes on the water-bath, cooled, the liquid made up to the mark with distilled water, and 20 c.c. (one-tenth of the whole) are titrated with iodine and starch. Into a second 200 c.c. flask, 10 c.c. of alcohol and 10 c.c. of stannous chloride solution are introduced, and this mixture is heated similarly, cooled, made up to the mark, and 20 c.c. withdrawn for titration. The difference between the two titrations represents the amount of stannous chloride oxidised by the dinitrobenzene present.



The stannous chloride solution is made by dissolving 150 grms. of tin in hydrochloric acid, adding 50 c.c. of the strong acid and diluting to a litre.—J. T. D.

Petroleum and its Distillation Products; Action of Formalin on —. A. Nastjukow. III., page 1082.

Rubber, particularly Crude Rubber; New Methods for the Analysis of —. G. Fendler. Ber. deutsch. Pharm. Ges., 1904, 208 and 215. Through Monit. Scient., 1904, 18, 834—838.

VARIOUS samples of rubber were examined by the author's method (this J., 1904, 764), and also by the methods of Harries, and Weber (see this J., 1901, 1123; 1902, 1404; 1903, 1211), and the following conclusions are drawn:—Harries and Weber's methods give results agreeing fairly well as regards percentage of pure caoutchouc, Weber's method being perhaps preferable, on account of its greater simplicity, when slightly modified in small details suggested by the author. With certain kinds of rubber, however, these two methods indicate a much too high percentage of caoutchouc, since certain resins present in rubber give compounds with nitrous acid, soluble in acetone and insoluble in benzene. Harries' and Weber's methods also give too

high a value to the insoluble matter in many cases. The author's method appears the best on account of its greater accuracy and simplicity.—T. F. B.

Dextrose; Indicator for use in the Quantitative Determination of — with Fehling's Solution. G. Griggi. Boll. Chim. Farm., 1904, 43, 565—567. Chem. Centr., 1904, 2, 1169—1170.

In the determination of dextrose with Fehling's solution, the author recommends as a suitable and sensitive indicator Bach's reagent (this J., 1899, 401, 519), so-called formal-doxime, CH_2NOH , the alkaline solution of which gives a violet coloration with copper salts. For the preparation of the indicator, 5.6 grms. of pure potassium hydroxide dissolved in water and 2.9 grms. of formaldehyde (7.25 c.c. of a 40 per cent. aqueous solution) are added to a solution of 6.95 grms. of hydroxylamine hydrochloride in cold water, and the whole diluted to 100 c.c.—A. S.

Fine Spirits; [Examination of —]. K. Windisch. XVII., page 1107.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Radium in American Carnotite. A. H. Phillips. Eng. and Mining J., 1904, 78, 673.

THE author carried out some experiments with 25 lb. of an ore from Richardson, Utah, containing about 10 per cent. of carnotite. From the radio-activity of the product obtained, he estimates that 1 ton of the ore would yield 1 gm. of chlorides having a radio-active power of 60,000, as compared with that of uranium. A specimen of "radium" prepared in Nov. 1902 is stated to be as active now as when first prepared.—A. S.

Colloidal Solutions; New Method of Preparing —, and their behaviour towards Barium Sulphate. L. Vanino and P. Hartl. Ber. 1904, 37, 3620—3623.

THE mould *Aspergillus oryzae* possesses strong reducing powers, and readily produces colloidal solutions. A solution of 0.01 gm. of gold chloride in 100 c.c. of water, to which has been added a few grains of rice with this mould growing on it, gives in a few days a blue solution of colloidal gold. For rapidly demonstrating the formation of colloidal solutions, Faraday's solution of phosphorus in alcohol is excellent; when added to a solution of gold chloride, it instantaneously produces a red solution, which gradually deepens in colour and becomes more bluish, then remaining permanent. Nearly all these colloid solutions (arsenic trisulphide, antimony trisulphide, cadmium sulphide, copper sulphide, silver sulphide, and metallic silver) when shaken with pure precipitated barium sulphate, become colourless, and deposit their contained substance. The action is purely mechanical (in some cases filtration through kieselguhr, or even prolonged agitation of the solution, produces the same effect), and furnishes another argument in favour of the view that these colloidal solutions are in reality suspensions of solid particles.—J. T. D.

Cholesterol. A. Windaus and G. Stein. Ber., 1904, 37, 3699—3708.

THE authors conclude from the results of their study of the decomposition products (oxidation products, &c.) of cholesterol, $\text{C}_{27}\text{H}_{46}\text{O}$, that it may be regarded as a complex terpene, composed of five reduced rings, of which one contains a double linking, and another a secondary hydroxyl group. It is pointed out that nearly all the resin acids of the conifers will give the characteristic reactions of cholesterol. —A. S.

Art Books.

TECHNISCH-CHEMISCHES JAHRBUCH, 1902. Ein Bericht über die Fortschritte auf dem Gebiete der chemischen Technologie. Herausgegeben von Dr. RUDOLF BIEDERMANN. 25ter Jahrgang. Friedrich Vieweg und Sohn, Braunschweig. 1904. Price M. 15.

8vo volume, containing 580 pages of subject-matter, a classified Review of New Books on Pure and Applied Science, filling 27 pages, and the alphabetical index of names of authors and subjects, followed by a Register of Patents, classified, and paged with reference to the body of the Jahrbuch. There are 72 illustrations. The matter is classified as follows:—I. Iron. II. Aluminium and Rare Earth Metals. III. Gold and Silver. IV. Copper. V. Zinc. VI. Lead. VII. Nickel, Cobalt, Manganese, and Chromium. VIII. Tin, &c. IX. Sulphur and Sulphuric Acid. X. Alkali Industry. XI. Electro-chemistry. XII. Ammonia and Cyanogen Compounds. XIII. Alkaline Earths, &c. XIV. Gases. XV. Phosphorus, Boron, Silicon, and Carbon. XVI. Glass. XVII. Earthenware. XVIII. Cements and Artificial Stone. XIX. Explosives, &c. XX. Illuminants. XXI. Fuels. XXII. Sugar. XXIII. Starch, Dextrin, and Glucose. XXIV. Fermentation Industries. XXV. Fats, Soaps, and Resins. XXVI. Ethereal Oils and Perfumes. XXVII. Water. XXVIII. Foods. XXIX. Organic Products. XXX. Albumins, &c. XXXI. Dyestuffs. XXXII. Textile Fibres. XXXIII. Paper. XXXIV. Photography. XXXV. Tanning, Glue, &c. XXXVI. Manures, Disinfection, &c. Following each of the foregoing groups, is a Section devoted to Statistics.

HANDBOOK OF CHEMICAL ENGINEERING. Illustrated with Working Examples and Numerous Drawings from Actual Installations. By GEORGE E. DAVIS, Chemical Engineer, &c. 2nd Edition. Davis Bros., 32, Blackfriars Street, Manchester. 1904. Price 2l. 2s.; for all Foreign Countries, 2l. 5s.

This work is complete in two 8vo volumes, each with an alphabetical index, Vol. I. containing 524 pages of subject-matter and 282 illustrations, and Vol. II. 515 pages of subject-matter and 257 illustrations.

The subject-matter of Vol. I. is classified as follows:—I. Introduction. II. The Technical Laboratory. III. Materials used in the Construction of Plant. IV. Weighing and Measuring. V. Steam Production and Distribution. VI. Power and its Application. VII. Moving Solids, Liquids, and Gases. VIII. Treating and Refining Solids. Vol. II.:—I. Application of Heat and Cold. II. Separating Solubles from Insolubles. III. Absorbing and Compressing Gases. IV. Evaporation and Distillation. V. Crystallisation and Dialysis. VI. Application of Electricity. VII. Construction of Packages. VII. Organisation and Building.

THE CHEMICAL SYNTHESIS OF VITAL PRODUCTS AND THE INTER-RELATIONS BETWEEN ORGANIC COMPOUNDS. Vol. I. By RAPHAEL MELDOLA, F.R.S., &c., Professor of Chemistry in the City and Guilds of London Technical College, Finsbury, London. Edward Arnold, 41 and 43, Maddox Street, Bond Street, London, W. 1904. Price, 21s. net.

LARGE 8vo volume, containing preface, table of contents, list of synthetical products, titles of journals quoted, and subject-matter filling 293 pages, followed by an alphabetical index. In his preface the author points out that, with Wöhler, our own countryman, Henry Hennell, must take equal rank, as being among the first to produce an organic compound independently of the living organism. Hennell was the first to synthesise alcohol from olefant gas, and this synthesis was effected at practically the same time as that of urea by Wöhler. The work is arranged in the dictionary form, and the matter treated of is classified as follows:—I. Hydrocarbons. II. Alcohols and Terpene Alcohols. III. Ketone Alcohols. IV. Glycols and Polyhydric Alcohols. V. Aromatic Alcohols and Phenols.

VI. Aldehydes and Ketones: Fatty Group. VII. Aromatic Aldehydes and Ketones. VIII. Carbohydrates and Glucosides. IX. Sulphur Compounds. X. Cyanogen Compounds. XI. Camphor and Terpene Group. XII. Flavone Group.

A TEXT-BOOK OF QUANTITATIVE CHEMICAL ANALYSIS BY GRAVIMETRIC, ELECTROLYTIC, VOLUMETRIC, AND GASOMETRIC METHODS. With Seventy-two Laboratory Exercises, giving the Analysis of Pure Salts, Alloys, Minerals, and Technical Products. By J. C. OLSEN, A.M., Ph.D., Professor of Analytical Chemistry in the Polytechnic Institute of Brooklyn, &c. D. van Nostrand Company, 23, Murray, and 27, Warren Streets, New York. 1904. 4 dols. net.

LARGE 8vo volume, containing 468 pages of subject-matter, 21 pages of tables, and the alphabetical index. The text is illustrated with 68 engravings.

The matter is classified as follows:—I. The Balance. II. General Operations. III. Determination of Water. IV. Determination of Metals. V. Determination of Acids. VI. Analysis of Alloys. VII. Analysis of Minerals. VIII. Electrolytic Methods. The Ionic Theory; Electrolytic Apparatus and Manipulation. Electrolytic Determination of Metals. IX. Volumetric Analysis. X. Acidimetry. XI. Standard Acids. XII. Standard Alkalis. XIII. Oxidation and Reduction Methods. XIV. Precipitation Methods. XV. Technical Analysis. A. Iron, Steel, and Coal. n. Water Analysis. c. Analysis of Oils and Fats. d. Gas Analysis. E. Stoichiometry.

THE TEXTILE FIBRES: THEIR PHYSICAL, MICROSCOPICAL, AND CHEMICAL PROPERTIES. By J. MERRITT MATTHEWS, Ph.D., Head of Chemical and Dyeing Department, Philadelphia Textile School. First Edition. John Wiley and Sons, New York. 1904. Price 15s. net. Chapman and Hall, Ltd., London.

8vo volume, containing 274 pages of subject-matter, with 69 illustrations, and an appendix with Bibliography of the Textile Fibres, followed by the alphabetical index. The matter is classified as follows:—I. Classification of the Textile Fibres. II. Wool and Hair Fibres. III. Chemical Nature and Properties of Wool and Hair Fibres. IV. Shoddy and Wool Substitutes. V. Other Hair Fibres. VI. Silk: its Origin and Cultivation. VII. Chemical Nature and Properties of Silk. VIII. The Vegetable Fibres. IX. Cotton. X. Physical Structure and Properties of Cotton. XI. Chemical Properties of Cotton, Cellulose. XII. Mercerised Cotton. XIII. Artificial Silks: Lustracellulose. XIV. Linen. XV. Jute, Ramie, Hemp, and Minor Vegetable Fibres. XVI. Qualitative Analysis of the Textile Fibres. XVII. Quantitative Analysis of the Textile Fibres. Appendix:—I. Microscopic Analysis of Fabrics. II. Machine for Determining the Strength of Fibres.

THE CULTIVATION AND PREPARATION OF PARA RUBBER. By W. H. JOHNSON, Director of Agriculture, Gold Coast Colony, West Africa, &c. Crosby Lockwood and Son, 7, Stationers' Hall Court, Ludgate Hill, London. 1904. Price 7s. 6d. net.

8vo volume, containing frontispiece showing a "flowering branch of the Para rubber tree," preface, 96 pages of subject-matter, with five illustrations, and the alphabetical index. The subject matter is classified as follows:—I. Introductory. II. The Para Rubber Tree (*Hevea brasiliensis*) at Home and Abroad. III. Cultivation of the Tree. IV. Insect Pests and Fungoid Diseases. V. Collecting the Rubber. VI. Preparation of Rubber from the Latex. VII. Yield of Para Rubber from Cultivated Trees. VIII. Establishment and Maintenance of a Para Rubber Plantation. IX. Commercial Value of the Oil in Hevea Seeds.

Trade Report.

I.—GENERAL.

NORWAY: PROPOSED REVISION OF CUSTOMS TARIFF OF —.

Bd. of Trade J., Nov. 10, 1904.

The following statement shows certain proposed changes in the Norwegian customs tariff which are under consideration:—

Article.	Unit.	Present Rate of Duty.	Duty Proposed by the	
			Customs Committee.	Government.
		Kroner	Kroner	Kroner.
Starch and potato meal.....	Kilo.	0.10	0.13	0.10
Calcium carbide	<i>ad val.</i>	Free	15 per cent.	Free
Celluloid manufactures	Kilo.	1.00	1.20	1.20
"Patent" glass	"	Free	0.03	Free
Glass tiles and floor slabs	"	"	0.06	0.06
Printing paper (except that made from wood pulp) ..	"	0.03	0.08	0.03
Sulphuric acid.....	100 kilos.	Free	0.50	Free
Gunpowder.....	Kilo.	0.10	0.12	0.10
Smokeless powder ..	"	0.10	0.50	0.10
Dynamite and similar explosives	"	0.10	0.20	0.10
Sugar.....	"	0.20	0.15	0.20

On most manufactures of metal increased duties are proposed both by the Customs Committee and by the Government.

YOKOHAMA IMPORTS OF DRUGS AND CHEMICALS.

Chem. and Druggist, Nov. 1, 1904.

A return of principal articles of import at the port of Yokohama during 1903 and 1902 includes the following drugs, chemicals, &c.:—

Articles.	1903.		1902.	
	Quantity.	Value.	Quantity.	Value.
		£		£
Acetic acid	lb.		313,850	5,184
Carbolic acid	"		585,477	15,033
Alcohol	gals.	415,331	27,175	236,760
Bismuth	sub-nitrate	lb.	34,392	8,139
Cocaine	hydrochloride	"		5,877
Glycerin	lb.	244,449	7,590	203,921
Hops	"	96,652	7,520	77,964
Potassium chlorate ..	"	"		563,265
Quinine	oz.	"		117,318
Eosin	lb.	"		2,237,806
Saltpetre	"	"		2,029,836
Santonin	"	5,145	5,385	
Soda ash	"	6,335,198	16,680	7,123,769
Soda, bicarbonate of ..	"	2,739,957	6,599	2,543,979
Soda, caustic	"	4,556,331	22,717	24,687
All other	"		46,120	140,213
Total		272,223		283,543

BOSNIA; CHEMICAL INDUSTRY AND TRADE OF —.

Foreign Office Annual Series, No. 3297.

The ammonia-soda factory at Lukavac near Tuzla gave as usual a high interest on the capital engaged. The production during the past year was about 18,000 tons, of which 17,000 tons were exported to Austria-Hungary and the Balkan States. The petroleum refinery "Danica," in Bosnian Brod, which is a dependency of the above-mentioned ammonia-soda factory, has not hitherto given very satisfactory results; last year it produced about 9000 tons of refined oil, of which 6000 tons were exported to Austria-Hungary and Servia. The crude oil comes from Galicia.

The sugar factory in Usora seems to have done no better in 1903 than heretofore. The culture of the beet, owing to the great care it requires, does not seem to find favour with the native population. About 5000 tons of sugar were produced last year, of which 4000 tons were consumed in the province, and the remainder exported to Dalmatia. The alcohol distillery in Tuzla continues to thrive. Of the 220,000 galls. produced in 1903, 176,000 galls. were sold in the province, and the remaining 44,000 galls. exported. The brewery at Serajevo is also very prosperous; 1,100,000 galls. of beer were brewed in 1903, the greater part of which was consumed in the country, the remainder being exported to Dalmatia and Montenegro.

The chemical works known as the "Elektricitäts-Aktien-Gesellschaft-Iajce" appears to be still suffering from the general over-production of carbide, but since the works have taken to producing chloride of lime and caustic soda they have paid a small dividend. The production in 1903 was 5000 tons of calcium carbide, of which 4500 tons were exported, and 3000 tons of chloride of lime and caustic soda, the whole of which was exported.

The "Holz-Verwerthungs-Gesellschaft" at Teslic in 1903 produced about 9000 tons of methylated spirit and acetate of lime, all of which was exported to Austria-Hungary. Also large quantities of charcoal were burnt, which is all delivered under contract to the iron works at Vares.

The iron mines and works at Vares proved as remunerative in 1903 as heretofore, and paid a dividend for the year of 9 per cent. About 40,000 tons of raw iron were produced, of which 25,000 tons were exported, chiefly to Hungary, and the remainder found a market in the country. 4000 tons of cast iron wares were produced and the greater part exported, and also about 40,000 tons of iron ore were exported to Trieste and Italy. The iron works at Zenica seem to have achieved rather better results in 1903 than hitherto. About 5000 tons of iron and steel from these works were sold in the country, and about 10,000 tons were exported to Austria-Hungary, Servia, Roumania, and the sandjak of Novi-Bazar. The match factory at Travnik, which is only on a small scale, and is content with a modest profit, sells its produce chiefly in the province, and exports a small quantity to the sandjak of Novi-Bazar.

Mining.—The mining industry does not seem to have been very active during the past twelvemonth. There was a falling-off in all minerals except in coal and iron pyrites, although the total result in value was an increase 3733% over 1902. The three mines of Kreka, Zenica and Kakanj-Doboj supplied all the requirements in coal of Bosnia and Herzegovina, but did not export more than 70,000 tons, the state of the market not being favourable. The gross production of all foundries, smelting works and salt works during the year 1903 shows an increase in all products both as regards quantity and value, except copper-work and raw iron, the total increase in value being 22,104%. The salt springs at Tuzla yielded 33,244,740 galls. of brine, of which 18,390,080 galls. were supplied to the ammonia-soda factory at Lukavac, and 14,854,660 galls. to the salt works, from which 13,126 tons of fine salt, 5154 tons of coarse salt, and 180 tons of briquettes, or a total of 18,460 tons of table salt, were produced.

In the subjoined table are particulars of imports and exports of chemical interest into and from Bosnia and the Herzegovina during the year 1903.

Articles.	Imports.		Exports.	
	Quantity.	Value.	Quantity.	Value.
	Met. Tons.	£	Met. Tons.	£
Sugar and molasses ..	8,053	157,062	333	10,496
Fatty substances ..	1,286	50,965	257	6,800
Oil	1,299	35,746	17	470
Liquors	13,253	171,064	3,932	46,174
Minerals	12,045	22,108	47,740	29,750
Drugs and perfumery ..	11	1,349	1	69
Dyestuffs and tans ..	13	379	3,183	8,892
Gums and resins	349	1,338	18	77
Mineral oil, tar, &c. ..	20,232	48,493	6,902	43,338
Paper and paper goods	1,496	34,296	74	1,397

Articles.	Imports.		Exports.	
	Quantity.	Value.	Quantity.	Value.
	Met. Tons.	£	Met. Tons.	£
Indiarubber goods	8	2,468	1	63
Leather and leather goods	916	114,507	106	3,234
Glass and glassware	1,284	19,820	34	291
Stone and stoneware	486	2,434	122	230
Bricks, earthenware, and china	14,488	21,731	3,720	1,651
Iron and ironmongery	9,739	195,304	41,457	209,221
Base metals and goods	343	22,174	253	16,373
Salt	1,643	4,011	40	43
Chemicals	1,337	13,106	20,834	310,627
Paints, varnishes, &c.	533	15,338	32	693
Candles and soap	949	23,484	20	620
Matches and explosives	1,576	78,170	112	4,244

FRANCE TRADE OF — IN 1903.

Foreign Office Annual Series, No. 3301.

The following returns show the values of certain articles of import and export under the head of "Special commerce" during the years 1902-3:—

Imports.		
Articles.	Value.	
	1902.	1903.
Food products:—	£	£
Wine	4,123,000	7,260,000
Sugar, French colonial	792,000	1,244,000
Margarine and other fats	523,000	500,000
Olive oil	704,000	620,000
Brandy and other spirits	423,000	332,000
Raw materials:—		
Coal and coke	11,268,000	10,020,000
Oil seeds and nuts	8,308,000	8,888,000
Hides, raw, and peltries	6,464,000	6,796,000
Copper	2,516,000	3,036,000
Minerals of all sorts	5,012,000	2,848,000
Sodium nitrate	1,876,000	2,160,000
Mineral oils	1,784,000	2,286,000
Vegetable oils, other than olive	1,228,000	872,000
Lead	840,000	772,000
Tin	1,088,000	892,000
Guano and chemical manures	456,000	872,000
Zinc	706,000	808,000
Iron and steel	448,000	464,000
Sulphur	360,000	460,000
Indigo	229,000	112,000
Hops	228,000	264,000
Saffron	172,000	138,000
Manufactures:—		
Skins, prepared	1,461,000	1,640,000
Potassium nitrate	32,000	32,000

Exports.		
Articles.	Value.	
	1902.	1903.
Food products:—	£	£
Wine	9,300,000	8,963,000
Sugar, raw	1,400,000	608,000
Brandy, spirits, and liqueurs	1,840,000	1,661,000
Sugar, refined	1,543,000	1,576,000
Fats of all sorts	964,000	908,000
Olive oil	180,000	180,000
Raw materials:—		
Hides, raw, and peltries	5,592,000	4,760,000
Chemicals	3,604,000	3,828,000
Copper and copper ore	1,792,000	1,176,000
Pig iron and steel	1,820,000	1,948,000
Coal and coke	808,000	780,000
Building materials	1,044,000	1,248,000
Oils, other than olive	1,076,000	1,010,000
Oil cake	800,000	716,000
Oil seeds and nuts	216,000	280,000
Indigo	81,000	68,000
Saffron	132,000	116,000

Exports—continued.

Articles.	Year.	
	1902.	1903.
Manufactures:—	£	£
Skins, prepared	4,828,000	4,680,000
Leather manufactures	2,500,000	2,452,000
Pottery and glassware	2,761,000	2,304,000
Dye-wood extracts	540,000	450,000
Perfumery	588,000	644,000
Colours	440,000	460,000
Soap, common	536,000	572,000
Candles, stearine, &c.	164,000	168,000

The annexed return shows certain articles of import from the United Kingdom (including Malta and Gibraltar) into France, during the years 1902-3:—

Articles.	Value.	
	1902.	1903.
	£	£
Coal	5,234,000	4,414,000
Chemicals and chemical manures	803,000	334,000
Copper	237,000	225,000
Iron, cast iron, and steel	274,000	306,000
Skins, dressed	697,000	858,000
Indiarubber goods	335,000	423,000
Pottery, glass, and crystal wares	196,000	222,000
Rubber	479,000	573,000
Coal tar	343,000	374,000
Raw hides and peltries	358,000	340,000

The subjoined table gives the value of some exports from France to the United Kingdom (including Malta and Gibraltar) during the years 1902-3:—

Articles.	Value.	
	1902.	1903.
	£	£
Wines	2,391,000	2,304,000
Sugar, raw	1,005,000	373,000
Dressed skins	1,862,000	1,839,000
Copper and copper ore	533,000	446,000
Brandy, spirits, and liqueurs	190,000	706,000
Raw hides and peltries	1,070,000	719,000
Sugar, refined	622,000	387,000
Pottery, glass, and crystal wares	821,000	770,000
Chemicals	583,000	535,000
Oils, essential	178,000	163,000
" other	196,000	146,000
Caoutchouc and gutta-percha	325,000	314,000
" manufactures of	111,000	137,000
Perfumery	142,000	150,000

II.—FUEL, GAS, AND LIGHT.

COKE FROM BY-PRODUCT OVENS.

Eng. and Mining J., Oct. 20, 1904.

The total coke made in the United States in 1903 was 25,262,360 net tons, as compared with 25,401,730 net tons in 1902. Of the 77,188 active ovens in 1903 there were 1,956 by-product ovens which produced 1,882,394 tons, or an average of 962.4 tons per oven. The average output of beehive ovens was 311 tons. The by-product ovens made 7.4 per cent. of the total coke, against 5.5 per cent. in 1902. The output of the by-product ovens in the current year will show a large increase, chiefly from the new plant of the Lackawanna Steel Company at Buffalo.

NATURAL GAS PRODUCTION OF THE U.S.A.

Bd. of Trade J., Nov. 10, 1904.

A report by the United States Geological Survey upon the production of natural gas in 1903 states that, notwithstanding the decreasing pressure in several of the most

important fields, the production in that year was greater than in any previous year, being valued at 35,815,360 dols., as compared with 30,867,863 dols. in 1902. Four States, namely, Pennsylvania, West Virginia, Indiana, and Ohio, produced 94 per cent. of the value of natural gas in 1903, and in the aggregate the United States produced 99 per cent. of the entire world's production.

IV.—COLOURING MATTERS AND DYE STUFFS.

INDIGO; EAST INDIAN —.

Chem. Trade J., Nov. 12, 1904.

The first general memorandum of the indigo crop of the season 1904 states that the reports of the area planted are still incomplete, but they indicate that the slight improvement of last year was only a temporary arrest of the decline in cultivation characteristic of recent years. In Bengal, where the estimated area sown this year is 223,100 acres, against 249,700 last year—a decrease of 10 per cent.—the plant has yielded badly, and the output is the lowest on record, about 60 per cent. of a normal crop for Bengal proper, 56 per cent. for North Bihar, and 80 per cent. for the other Bihar districts. For the whole province, it may be estimated at not less than 60 per cent. The total yield will probably not be more than 35,000 factory maunds. In the United Provinces the area in 1902 was 185,800 acres, and increased in 1903 to 140,800; but the reports received this spring indicate a contraction in the present season. The seed germinated well, and up to July a normal output was expected. Since then the prospects have deteriorated, serious damage being done by the heavy and continuous rains in the second half of July and throughout August. The output is now estimated at not more than 75 per cent. of the normal for the province as a whole. In the Punjab, the estimated area in the four principal growing districts is 73,900 acres, the area finally ascertained in 1903 being 74,200 acres. The crop, on the whole, is in good condition. In Madras, the area sown is only half that of the corresponding period of last year, the returns from the Rajiwar villages up to the end of August showing 71,800 acres, equal to about 48 per cent. of that in the preceding year. It is less than the average of five and ten years by 54 and 66 per cent. respectively. The decrease is marked in Kistna, Nellore, Kurnool, and Duddapah, and is attributed to the fall in prices and to want of timely rains. The crop is reported to be generally good, but to require rain in parts.

V.—PREPARING, BLEACHING, Etc., TEXTILES, YARNS, AND FIBRES.

ALIZARIN ASSISTANT: U.S. CUSTOMS DECISION.

Nov. 1, 1904.

It was held that a preparation obtained by sulphonating tallow and treating with an alkali, processes used to make Turkey Red oil, is dutiable at 30 per cent. *ad valorem* as "other alizarin assistant not specially provided for," under paragraph 32 of the present tariff. This article had been the subject of a decision of the United States Circuit Court, which held that it was dutiable at 20 per cent. *ad valorem* under Section 6, as a "manufactured article unenumerated," on the ground that it was used as a softener. Further evidence taken by the Board led them to the different conclusion above given, as it was shown that Turkey Red oil was used as a finisher and softener for cotton goods.

—R. W. M.

VII.—ACIDS, ALKALIS, Etc.

MAGNESITE IN THE UNITED STATES.

Eng. and Mining J., Nov. 3, 1904.

In a recent report by the United States Geological Survey on the production of magnesite, it is stated that in the United States the entire product of magnesite comes from California. During 1903 the quantity reported was 3744 short tons crude, valued at 10,595 dols., equivalent to 1361 tons calcined, worth 20,515 dols.

The production of crude magnesite is practically in the hands of one firm at present. The crude product is sent to

the manufacturers of carbon dioxide gas for calcination, and the calcined product is used by the paper mills. The demand for both crude and calcined magnesite is limited on the Pacific coast. Owing to a freight rate of 18 dols. to 15 dols. a ton on shipments to eastern points, it is not shipped out of California except to the paper mills in Oregon. The production of California could be quadrupled if the demands of consumption warranted the increase.

The principal producing point in California is in the vicinity of Porterville, Tulare county, though small quantities still come from Chiles valley and Pope valley, Napa county. The most extensive deposit in California is in Placer county, but it is in an almost inaccessible mountain region, where a very costly road would be necessary to get the product out, and the deposit therefore has not been utilised. Near Sanger, Fresno county, is another deposit, which is now being opened. A deposit has been discovered also near Walkers Pass, Kern county, but it has never been developed. There are also unutilised deposits near Morgan Hill, Santa Clara county.

IRON PYRITES, &c.: OPENING FOR — IN RUSSIA.

Foreign Office Annual Series, No. 3253.

H.M. Consul at Warsaw states that there is a large and growing demand for imported iron pyrites in factories in Poland, and indeed throughout the empire, as those found in the Urals, Tver district, and the Caucasus do not nearly suffice. This demand, which is put down at 40,000 tons for Poland alone, is partly covered by a Berlin firm to whom a British firm, who have large mines in Spain and Portugal, have given the monopoly of the sale of their pyrites for Eastern Europe, but it appears that there is plenty of room for others to come in, and other nations are already about it. The Germans are beginning to compete with Westphalian pyrites, and the Hungarian mines at Schmöllnitz have already come in to a considerable extent and, as their present output is pretty nearly covered by the home demand, are specially enlarging their works with a view to obtaining a larger portion of the Russian trade. A British firm in a position to supply iron pyrites would do well to look into the matter.

The colour factory at Skarzysko, which seems to be doing well in spite of the war, complains of the length of time it takes to get red oxide from England, especially in winter, when it takes three months to come. The import of it is, however, small, and chiefly for three factories in the district. Complaint is also made that the Russian Customs refuse to recognise pure iron ore from India as a pure mineral product, and charge duty on it under paragraph 125b of the tariff as if it were a colour like red oxide. At present the iron factories import almost all Greenland cryolite, tin oxide, and calcium fluoride, for enamelling from Berlin, and there seems no reason why British firms should not compete.

IX.—BUILDING MATERIALS, Etc.

SAND-LIME BRICK.

Eng. and Mining J., Oct 27, 1904.

According to the United States Geological Survey, there are in America at present about 50 plants, with a total capacity of approximately 1,000,000 bricks a day. The experience of these plants indicates that sand-lime brick can usually be manufactured at a cost below that of common clay brick. Sand-lime bricks have been in use long enough, both in America and in other countries, to prove that when properly made they have sufficient strength and sufficient water- and weather-resisting qualities to make them a safe building material.

The commercial development of the industry dates back only 15 years in foreign countries, and not more than four years in the United States. In 1896 Germany had only five factories where sand-lime brick was made, but now it has about 200, with an annual output of between 350,000,000 and 400,000,000. Early in 1901 a plant was built in Michigan City, Ind. In 1902 about 20 plants were in existence and 6,000,000 bricks were actually sold. Full data are not obtainable as to the actual output in 1903, but about 20,000,000 bricks have been reported as sold in that

year. Many of the factories had just started, and were not manufacturing to their full capacity during the year.

PORTLAND CEMENT; AMENDED DEFINITION FOR —.

Scient. Amer. Suppl., Oct. 29, 1904.

An amended definition of the term Portland cement has been adopted by the Association of German Portland Cement Manufacturers. It is, in this, defined to be a hydraulic cementing material of specific gravity not less than 3.1 in the calcined state, and containing not less than 1.7 parts by weight of lime to each one part of silica + alumina + iron oxide, the material being prepared by mixing the ingredients intimately, calcining them to not less than clinkering temperature, and then reducing the whole to the fineness of flour.

LUMBER; FIREPROOFED — : U.S. CUSTOMS DECISION.

Oct. 25, 1904.

It was decided that lumber which had been treated with solutions of ammonium sulphate and phosphate to render it fireproof was dutiable at 2 dols. per 1000 ft. as "sawed lumber not specially provided for," under paragraph 195. The assessment of duty at 35 per cent. *ad valorem* as a "manufacture of wood" under paragraph 25 was overruled on the ground that the fireproofing treatment had not changed its character sufficiently to remove it from the category of lumber. The Treasury Department, Nov. 1, 1904, has appealed against this decision to the United States Circuit Court, and pending their decision the higher rate of duty will be levied.—B. W. M.

X—METALLURGY.

BRITISH MINERAL OUTPUT IN 1903.

Mines and Quarries: General Report and Statistics for 1903. Part III., Output. Home Office [Cd. 2283]. Eyre and Spottiswoode, East Harding Street, E.C.
Prices 1s. 6d.

Part 9 [Cd. 2283] of the General Report on Mines and Quarries for 1903, issued by the Home Office as a Blue-book, gives the account and value of the minerals produced, in general and in detail. The introductory summary shows that the total value of the minerals raised during the year amounted to 101,808,404*l.*, a decrease of 5,296,480*l.* as compared with 1902. This decrease is to be accounted for by the fall in the average price of coal from 8*s.* 2*d.* 84*d.* per ton in 1902 to 7*s.* 7*d.* 93*d.* in 1903. The total output of coal was the highest hitherto recorded, viz., 230,324,469 tons, but the value was only 88,227,547*l.*, as against 93,521,407*l.* in 1902, when the output was less by more than 8,000,000 tons. The quantity of coal exported, exclusive of coke and patent fuel and of coal shipped for the use of steamers engaged in foreign trade, was 44,950,057 tons, an increase of nearly 2,000,000 tons on the exports for 1902. Germany, France, and Italy each received over 6,000,000 tons, Sweden over 3,000,000 tons, and Russia, Spain, Denmark, and Egypt each over 2,000,000 tons. Adding the 2,055,444 tons exported in the form of coke and patent fuel, and the 16,799,848 tons shipped for the use of British and foreign steamers engaged in foreign trade, the total quantity of coal which left the country was 63,805,349 tons. The amount of coal remaining for home consumption was 166,529,120 tons, or 3.980 tons per head of the population; 18,302,240 tons were used in the blast furnaces for the manufacture of pig iron, as against 17,649,187 tons in the previous year. The output of iron ore, 18,715,645 tons, shows a further increase of 289,641 tons, but the value, 3,229,987*l.*, is less by 58,164*l.* than in 1902. The ore yielded 4,500,972 tons of iron, or about one-half of the total quantity of pig iron made in the country; 6,314,162 tons of iron ore were imported during the year, 78 per cent. of which came from Spain. Copper, gold, lead, silver, and zinc all show an increase on the figures of 1902 both in the amount and value of the metal obtained, and in the case of tin, although the amount obtained is less, the value is greater. Among non-metallic minerals the increase in the output of natural gas at the Heathfield workings, from 150,000 to nearly 1,000,000 cubic feet, may be noticed.

GOLD PRODUCTION OF CANADA.

Eng. and Mining J., Nov. 3, 1904.

Official returns show that the gold produced in the Canadian Yukon for the nine months ending with September this year was 8,503,724 dols., that being the amount on which the Government royalty of 2.5 per cent. was paid. Adding two districts from which returns were incomplete, and also some gold which may have escaped royalty, the total for the nine months was about 10,000,000 dols. As the Yukon working season is over, the probability is that the total for 1904 will be somewhat less than the 12,500,000 dols. reported last year.

IRON AND STEEL PRODUCTION OF THE WORLD.

Eng. and Mining J., Oct. 20, 1904.

The figures collected for the *Mineral Industry*, Vol. XII., show that the total production of pig iron in 1903 was 46,723,000 met. tons. Although the United States output was nearly stationary, and several countries, such as Canada and Russia, showed decreases, the total exhibits a gain of 5.5 per cent. over the previous year, and is evidence of the activity of trade and construction all over the world.

The following table gives the quantity of pig iron made in 1902 and 1903, the figures being reduced to met. tons, for purposes of comparison:—

	1902.	1903.
United States	13,003,465	13,207,400
Germany	5,402,000	10,005,434
Great Britain	5,603,976	5,504,113
Three chief producers	35,009,441	37,716,947
Austria-Hungary	1,315,000	1,355,000
Belgium	1,102,910	1,216,300
Canada	204,670	205,415
France	2,427,427	2,037,000
Italy	34,500	23,350
Russia	2,505,000	2,210,079
Spain	330,747	330,304
Sweden	504,400	400,700
Other countries	615,000	625,000
Total	44,310,738	46,723,007

The increase was largely due to the gain of 20 per cent. by the German blast furnaces, though it was assisted by other European countries, all of which, except Russia, had a prosperous year. The German increase kept up the proportion of the total made by three leading producers, which was 79.9 per cent. of the total in 1902, against 79.1 per cent. in 1903; although the proportion furnished by the United States alone fell from 40.6 per cent. in 1902 to 38.9 per cent. last year.

The proportion of pig iron made into steel, which had been steadily increasing for a considerable period, received a slight check last year. The total steel produced showed a gain of only 2.5 per cent., as against 5.5 per cent. in pig iron. This was due to a decline in American steel production, and to a greater output of foundry iron in Germany and Great Britain.

The total steel production of the world is given in the following table, also in metric tons:—

	1902.	1903.
United States	15,186,406	14,768,303
Germany	7,780,682	8,901,315
Great Britain	5,102,420	5,114,647
Three chief producers	28,069,508	28,684,235
Austria-Hungary	1,145,900	1,144,000
Belgium	776,875	981,740
Canada	184,950	182,500
France	1,635,300	1,884,000
Italy	119,500	116,000
Russia	1,730,350	1,588,000
Spain	163,564	190,642
Sweden	283,500	310,000
Other countries	412,000	418,000
Total	34,519,347	36,306,257

The United States showed a decrease of 2·8 per cent., while Germany's gain in steel was 13·1 per cent. and that of Great Britain 0·2 per cent. only, against increases of 20 per cent. and 3·4 per cent. respectively, in pig iron. The United States last year made 41·8 per cent. of the total steel, against 44 per cent. in 1903; while the three leading producers reported 81·1 per cent. of the total, as compared with 81·8 per cent. in the preceding year. Germany, which took the second place as an iron producer for the first time in 1903, has long been far ahead of Great Britain in steel. The British iron-masters have kept up the manufacture of wrought or puddled iron to a greater extent than those of any other country.

A marked feature of the iron trade in 1903 was the withdrawal of the United States, to a large extent, from the list of exporting nations. The active condition of trade at home during a large part of the year induced manufacturers to give up their foreign business, and in some cases they found it necessary to import iron and steel. It was largely to this that the increase in German output and trade was due. This year, conditions have been reversed, but the export business has hardly been recovered.

IRON AND STEEL IN GREAT BRITAIN.

Eng. and Mining J., Oct. 20, 1904.

The production of pig iron in Great Britain for the first half of 1904, as reported by the British Iron Trade Association, was less than that of the first half of 1903 by 330,033 tons, or 7·5 per cent. If a further comparison is made with the first half of 1902, a decrease is shown of 47,513 tons, or 1·2 per cent. It is necessary to go back to 1901 to find a lower output.

The production of pig iron for the half-year is shown in the following table, in long tons, in comparison with the first half of last year:—

	1903.	1904.
Foundry and forge	2,086,813	1,850,468
Bessemer pig	1,716,069	1,606,690
Basic pig	466,371	506,970
Spiegel and ferro	110,245	84,872
Totals	4,378,998	4,048,965

Of the 15 ironmaking districts into which Great Britain is divided for the purposes of these returns, 11 show a decrease, and the remainder show an increase in 1904 compared with 1903. The most notable declines appear to have taken place in Scotland, in West Cumberland, in Lancashire, in Notts and Leicestershire, in South and West Yorkshire, and in Cleveland.

The total production of steel ingots for the first half of 1904 was as follows, in long tons:—

	Acid.		Basic.		Total.
	Tons.	Per ct.	Tons.	Per ct.	Tons.
Bessemer	553,071	81·8	312,618	13·3	865,689
Open-hearth	1,330,833	58·3	343,247	13·6	1,674,080
Totals	1,879,953	74·1	655,865	26·9	2,535,818

There were 480 open-hearth furnaces in existence at the close of the half year. A notable change took place in the Cleveland district, the two works which formerly made acid steel having adopted the basic process, so that all the steel made in that district in 1904 was basic steel.

The production of rails from Bessemer steel during the half year was 523,771 tons, which compares with 483,964 tons in the first half of 1903, and 410,430 tons in 1902. The greatest increase in rails was in the South Wales district.

The total production of steel ingots in the half-year was as follows, in long tons, comparisons being made with the first half of 1903.

The total decrease this year was 0·6 per cent. Open-hearth steel this year was 65·9 per cent. of the total, and

Bessemer, or converter, steel was 34·1 per cent., against 64·8 and 35·7 per cent. respectively in 1903. The open-hearth process continues to make steady gains.

	1903.	1904.
Bessemer	911,670	865,683
Open-hearth	1,639,239	1,670,129
Totals	2,550,909	2,535,812

INDIA; MINERAL PRODUCTION OF —.

Ch. of Commerce J., Nov., 1904.

The production of salt in India averages about a million tons annually, the total in 1903 being 894,840 tons owing to the much smaller production in Bombay and Madras. More than two-thirds of the Indian production is sea salt. Saltpetre is most largely produced in Bihar, whence the article is sent to Calcutta for export after refinement; the average annual exports thence of refined saltpetre in the last five years amount to 374,629 cwt.

Although the output of coal last year (7,438,886 tons) was progressive the figures show an arrest of the rapid expansion of recent years. India now takes the lead as a coal producer in the British Empire outside Great Britain. The quantity exported last year rose slightly and now amounts to nearly half a million tons. India is yearly approaching a state of being able to supply all her own wants in fuel, the import of foreign coal shrinking gradually; this amounted in 1903-4 to 180,040 tons imported as merchandise, and 26,789 tons as Government stores, or one-fourth of the quantity imported nine years previously. The greatest development has occurred in Raniganj, in which the collieries are from 120 to 140 miles only from Calcutta, but Jherria, some 40 miles further from the port, is being developed and is rapidly overtaking Raniganj as a producer.

The development of the petroleum resources of Burmah and Assam has exceeded the rate of growth in the coal trade. In 1903 the production was nearly 67 million gallons, and in 1903 it rose to nearly 88 million gallons, of which over 85 million gallons were raised in Burmah. Though this is far from meeting the total demand in India, the home production has already affected the imports of foreign oil, which has steadily decreased, during the past three years, from nearly 99 million gallons in 1901-2 to 80½ million gallons in 1903-4. The exports from Burmah of the products of petroleum were:—

Mineral Oil.	1902-3.	1903-4.
Kerosene (gallons)	17,271,151	35,586,378
Other kinds (gallons)	3,454,638	3,235,803
Paraffin wax (cwt.)	51,470	35,969

Besides the steady rise in output from Kolar, where the gold-mining industry has gradually expanded since 1885, and during the past year reached an output of 600,000 oz., work has commenced in the Nizam's dominions, and during the 10 months, Feb.—Dec., 1903, 34,114 oz. of gold were raised. The Burmah output declined from 2179 oz. in 1902 to 1905 oz. in 1903. The ancient native industry of smelting iron has undergone a gradual decline, but it still lingers in parts of Madras and the Central Provinces. Except in Barakar, where the conditions for manufacturing pig-iron are favourable owing to the proximity of ore supplies and good coking coal, no successful attempt has been made to manufacture iron on a large scale in India. Of graphite the output in Travancore was 3,894 tons only, as against 4,575 tons in 1902.

The most remarkable development has taken place in the quarrying of manganese ore. In 1903 the total output reached a record of 171,800 tons, which places India amongst the first two of the countries producing high-grade manganese ore. That produced in the Central Provinces is of very high grade, ranging from 51 to 54 per cent. of the metal, and in consequence of its high quality

is able to pay the heavy tax of freight over 500 miles of railway, besides the shipment charges to Europe and America, the whole of the ore being exported to Great Britain, Germany, and the United States. The largest proportion of ore is raised in the Nagpur district, though work has been begun in Bhandara and Balaghat, and prospecting in Chaitgarh district, in the Jhabua State in Central India, and a few other places, besides Vizianagram, where mining still continues. The work hitherto has been little more than quarrying, and no approach to exhaustion can be said to have occurred in the chief deposits, which, however, are being worked for the highest grade of ore only. India still retains the lead amongst the producers of mica, the exports of which in 1903-4 were 21,548 cwt., value Rs. 12,94,453, as against 20,412 cwt., value Rs. 13,13,909 in 1902-3. The centres of production are still in the Nellore district in the south, and a belt of pegmatites near the borders of the Hazaribagh, Gaya, and Monghyr districts in Bengal. Little or no work has been done in the other areas where the mineral is known to occur in plates of marketable size and quality.

Amongst other minerals of value the magnesite deposit of the so-called "Chalk Hills," near Salem, have attracted attention on account of the great purity of the mineral; 3,540 tons were raised in 1902, and 826 tons in 1903. Tin mining continues on a small scale in Southern Burmah and the Karenni. In the Tensasserim division the ore raised in 1903 amounted to 110 tons, valued at Rs. 1,37,295. The quarrying of slate is an important industry along parts of the outer Himalayas, near Rewari in the Punjab, and in the Kharakpur hills of Monghyr district, but accurate statistics are only available for the two or three large companies producing slate.

GOLD AND SILVER PRODUCTION OF THE WORLD IN 1903.

Bd. of Trade J., Nov. 3, 1904.

The following figures are taken from a statement issued by the Director of the Washington (U.S.A.) Mint:—

The production of gold in the world amounted to 325,527,200 dols. in 1903 against 295,889,600 dols. in 1902.

The world's production of silver in 1903 amounted to 170,443,670 fine ounces, valued at 92,039,600 dols., compared with 166,955,639 fine ounces, valued at 88,486,500 dols. in 1902.

GOLD PRODUCTION IN AUSTRALIA.

Eng. and Mining J., Oct. 20, 1904.

Official figures, compiled by the Mines Department of New South Wales, show that, during the eight months of the current year ending with August, there was a slight decrease in the gold production of Australia, as compared with the corresponding period in 1903. The following table shows the production of the different States for the eight months, four of them being official, while the comparatively small production for South Australia and Tasmania is estimated. The figures are in ounces of fine gold:—

	1903.	1904.	Changes.
West Australia	1,390,640	1,313,985	D. 76,795
Victoria	484,880	502,839	I. 17,979
Queensland	429,963	414,539	D. 15,474
New South Wales	152,337	178,644	I. 26,307
South Australia and Tasmania	32,000	32,000	..
Totals	2,489,820	2,441,737	D. 48,083

It will be noted that the principal decrease is shown in the reports from Western Australia; and this is due to the fact that the output from the mines at Kalgoorlie is a little below that of the previous year. Notwithstanding this, the production of this State is 55 per cent. of the total output for the present year. In Queensland also there is a slight falling off. This was confined to the Charters Towers and Gympie fields, the Mount Morgan and the minor fields having shown considerable gains. The production reported from Victoria shows a satisfactory growth;

this is largely due to satisfactory yields reported this year from the Bendigo goldfield.

COPPER PRODUCTION OF UNITED STATES IN 1903.

Bd. of Trade J., Nov. 10, 1904.

The official figures of the Geological Survey give the production of copper in the United States in 1903 as 311,627 tons (of 2,240 lb.), the figures for the preceding year being 294,423 tons. The output from Montana represented 38.9 per cent. of the whole; that from the Lake Superior District, 27.5 per cent.; and from Arizona, 21.1 per cent.; the three districts combined thus contributed 87.5 per cent. of the total output in 1903.

THERMIT: U.S. CUSTOMS DECISION.

Oct. 26, 1904.

Thermit, a mechanical mixture of four parts of powdered aluminium and one part of powdered oxide of iron, and used to produce high heat for welding purposes, was held to be dutiable at 45 per cent. *ad valorem*, under paragraph 193 of the present tariff, as "an article not specially provided for in this Act, composed wholly or in part of aluminium or other metal."—R. W. M.

XII.—FATS, FATTY OILS, Etc.

OLIVE OIL PRODUCTION IN ITALY.

U.S. Cons. Rep., No. 2100, Nov. 5, 1904.

According to the *Moniteur Officiel du Commerce*, Italy produced 86,119,700 gallons of olive oil during the year 1903-4, or 37,248,000 galls. more than in 1902-3; 1,585,200 galls. more than in 1901-2, and 5,811,700 galls. more than the annual average.

Much of this year's olive crop was being abandoned because of its abundance. It hardly paid to pick the fruit in some parts; besides, the drought from July to October had ravaged Italy and seriously affected the quality. The fruit, though abundant, was small and poor, hence of little value for making oil. This is to be regretted, for it was otherwise free from disease and well skinned.

The cultivation of the olive is increasing constantly, though slowly. The area devoted to olives increased from 2,678,666 acres in 1901 to 2,683,550 acres in 1902, and 2,690,968 acres in 1903. The oil yield per acre last year was 32 gallons, or 13.8 gallons more than the yield of 1902-3, 0.3 gallons more than the yield of 1901-2, and 2 galls. more than the average.

XIII. B.—RESINS, VARNISHES, Etc.

GUM GUAIAO: U.S. CUSTOMS DECISION.

Nov. 3, 1904.

It was decided that gum guaiac which had been freed from mechanical impurities by straining, was dutiable at $\frac{1}{2}$ c. per lb. and 10 per cent. *ad valorem* under paragraph 20 of the present tariff. The claims of the importer for free entry under paragraph 548, as a "crude gum," or under paragraph 617, as a "crude vegetable substance," or at 10 per cent. *ad valorem* under section 6, as an "unmanufactured article unenumerated" were overruled.—R. W. M.

XIII. C.—INDIA-RUBBER, Etc.

RUBBER IMPORTS INTO FRANCE.

Dépêche Col.; through U.S. Cons. Rep., No. 2100, Nov. 5, 1904.

The development of the bicycle and automobile industries, the use of rubber in the manufacture of garments, and the extension of electric lighting and the telephone have caused enormous importations of raw rubber into Europe.

Brazil last year exported over 80,000 tons, of which one-fifth was consumed by France. The production of the world is estimated at 50,000 tons, one-eighth of which goes to France. The industrial consumption of raw rubber and gutta-percha in France in 1903 was 6,217 tons, of which 5,000 tons came from the principal foreign producing countries, and the remainder from the French colonies.

Brazil, despite foreign competition (especially from occidental Africa), is the principal furnisher of France, entering more than 2,000 tons annually; England enters some 1,400 tons; India, 500; Peru, 280; Germany, 260; the United States, 245; Belgium, 140; and divers little countries of the Antilles, Central America, and elsewhere, 350.

The English market, which on account of its great importations of Brazilian rubber is the principal intermediary between production and French industry, is of much greater importance than all the other markets. The Belgian and German markets do not furnish France with half as much as do its own colonies.

Within the last few years Bordeaux has become an important rubber market. Considering the length of time it has existed it compares favourably with that of Antwerp. The latter market, at its creation in 1891, imported 210 tons. Since that year the imports, by tons, have been as follows: in 1892, 629; in 1893, 1,671; in 1894, 2,745; in 1895, 5,310; in 1896, 11,158; in 1897, 17,241; in 1898, 20,145; in 1899, 34,038; in 1900, 56,980; in 1901, 58,492; in 1902, 54,089; in 1903, 57,264. Bordeaux imported 510 tons in 1894; 1,755 tons in 1899; 2,395 tons in 1900; 2,353 tons in 1901; 6,784 tons in 1902; and 11,130 tons in 1903.

XVII.—BREWING, WINES, SPIRITS, Etc.

ALCOHOLIC PRODUCTS IN SPAIN; MANUFACTURING AND CONSUMPTION DUTIES ON —.

Ch. of Commerce J., Nov. 1904.

A Spanish law, dated July 19th, imposes manufacturing and consumption duties on alcoholic products. The consumption duties, which are leviable on both native and imported products, and take the place of the surtax of 37·50 pesetas per hectol. previously levied on such products, are fixed at the following rates:—

Neutral spirits and alcohols, anise-seed spirits, with or without sugar, rum, cognac, gin, and other spirituous compositions; * also liqueurs.....	litre (liquid)	0·50
Denatured alcohol.....	hectol.	5·00

Pesetas.

Drawback of the manufacturing and consumption duties paid on the alcohol contained will be allowed on the exportation of the following products: Wines fortified with alcohol; alcohols, spirits, and liqueurs manufactured in the country; "mistelas"†; chemical products, perfumery, varnishes, and medicines prepared with alcohol. A similar drawback will also be allowed at the time of their entering into consumption, on spirits of wine which have been rectified. The Government are authorised to impose additional import duties at varying rates, to countervail the consumption duty on the alcohol used in the manufacture of similar articles of domestic production, on chloroform, ether, pharmaceutical products, and perfumery containing alcohol, and on dari and yeast. The importation of mixtures of alcohol and ether is prohibited.

XXII.—EXPLOSIVES, MATCHES, Etc.

DAINGEROUS GOODS AND EXPLOSIVES IN SHIPS; REVISED AND CONSOLIDATED INSTRUCTIONS RELATING TO THE CARRIAGE OF —.

F. J. S. Hoopwood and W. J. Howell. Bd. of Trade, Sept. 1904.

Explosives.—The regulations are those of the Explosives Act of 1875, licensed explosives being divided into seven classes, viz.:—(1) Gunpowder. (2) Nitrate mixtures. (3) Nitro compounds. (4) Chlorate mixtures. (5) Fulminate. (6) Ammunition. (7) Firework. Gunpowder, &c., must be conveyed in a single or double package of such construction that it will not be broken or become defective whilst being conveyed. The interior of the package must be kept clean and free from grit, and no iron or steel must be used in the construction unless same is effectually covered with tin, zinc, &c. The nature of the explosive

* Including varnishes prepared with alcohol; pharmaceutical products and perfumery containing alcohol; ether, chloroform, and other products manufactured with alcohol.

† Wines made with sugar, cinnamon, &c.

and the name and address of the sender must be conspicuously attached by a mark on the outside of the package.

Inodorous Felt and India-rubber Solution are classed as "dangerous goods" and are not accepted as general cargo.

The following packing regulations are stipulated for the unmentioned goods:—

Methylated Spirit.—Substantial iron drums properly closed and secured.

French Polish.—Hermetically sealed tins packed in a wooden iron-bound case containing not more than 15 tins.

Carbide of Calcium.—Hermetically sealed tins enclosed in wooden cases or air-tight and damp-proof iron drums.

Sulphuric Acid.—Electrically welded steel drums.

Liquid Ammonia.—Iron vessels tested up to a pressure of 675 lb. per sq. in.

Aqueous Solution of Ammonia (sp. gr. 0·880).—Twelve-gallon drums, capable of withstanding a pressure of 66 lb. per sq. in. with an empty space of 5·83 per cent. in each drum.

Carbon Bisulphide.—Strongly made and perfectly tight two-gallon drums tested to 40 lb. per sq. in. with an empty space of at least 10 per cent., packed in perforated wooden cases with not more than two drums in each case.

Sodium Sulphide and Potassium Sulphide.—Strong air-tight steel drums.

Oiled Materials.—Perforated cases.

Potassium Chlorate.—Iron drums or strong paper-lined cases.

Amorphous Phosphorus.—Tin cases.

Collodion Cotton.—When not intended to be used by itself as an explosive, it is not regarded as coming within the meaning of the Explosives Act when it is—

(1) In solution in alcohol and ether.

(2) Wet.

(3) Saturated in methylated spirit and contained in air-tight cases.

Marking and Packing of Poisons.—To be marked according to the terms of section 17 of Sales of Poison and Pharmacy Act, 1868.

Sodium Peroxide.—Strong iron or steel drums.

Carbolic Acid.—Thoroughly sound casks.

Liquefied Carbonic Acid.—Cylinders after the pattern recommended by the Committee appointed by the Home Office in 1895 on the manufacture of compressed gas cylinders.

Naphtha.—Gas-tight drums with not less than 5 per cent. clearance packed in sawdust in iron tanks.

Lamp Black.—Printed paper should not be used in packing lamp black.

Sheep Dips and Similar Preparations.—To be marked "Poison" in conspicuous character.

Petroleum Spirit.—Steel barrels or drums.

Carbon Papers.—Air-tight tins within a suitable case.

—G. W. McD.

Patent List.

N.B.—In these lists, [A.] means "Application for Patent," and [C.S.] "Complete Specification Accepted."

Where a Complete Specification accompanies an Application, an asterisk is affixed. The dates given are (i) in the case of Applications for Patents, the dates of application, and (ii) in the case of Complete Specifications Accepted, those of the Official Journals in which acceptances of the Complete Specifications are advertised.

Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, AND MACHINERY.

[A.] 23,600. Petavy. Furnaces. [Fr. Appl., Nov. 3, 1903.]* Nov. 1.

" 23,938. Grossmann. Method and apparatus for the condensation, absorption, and chemical combination of gases in the presence of liquids, or of liquid and solid substances. Nov. 5.

- [A.] 28,942. Allison (Niles-Bement-Pond Co.). Filter press plate.* Nov. 5.
- " 23,983. Bay. Process of and apparatus for continuous distillation.* Nov. 5.
- " 24,083. Kestner. Means for moistening or washing air or other gases.* Nov. 7.
- " 24,038. Crawford. Rotary kilns. Nov. 7.
- " 24,331. Harvey and Wilson. Crucible furnaces. Nov. 9.
- " 24,361. Baker. Means for compressing gases. Nov. 9.
- " 24,363. Green. Separation of volatile compounds by distillation, and apparatus therefor. Nov. 10.
- " 24,446. Moura. Filter-press frames. Nov. 11.
- " 24,511. Oxford, Buxton, and Oxford. Apparatus for drying semi-liquids. Nov. 12.
- " 24,547. Birrell. Furnaces. Nov. 12.
- " 24,587. Thompson (Best). Furnaces.* Nov. 12.
- [C.S.] 26,386 (1903). Shaw. Nozzles for discharging liquids. Nov. 16.
- " 27,935 (1903). Van Steenkiste. Drying apparatus. Nov. 16.
- " 28,791 (1903). Houghton, and The United Alkali Co., Ltd. Apparatus for separating liquid from solid matter, and partially drying the solid matter. Nov. 9.
- " 2002 (1904). Hanberg. Centrifugal separators. Nov. 9.
- " 18,489 (1904). Schnelle. *See under XI.*
- " 19,186 (1904). Suzuki. Vacuum evaporating apparatus. Nov. 16.
- " 20,857 (1904). Kostalek. Filters. Nov. 9.

II.—FUEL, GAS, AND LIGHT.

- [A.] 28,444. Nairn. Manufacture of incandescent gas mantles.* Oct. 31.
- " 28,787. Griffin and Cox. Production of gas. Nov. 3.
- " 23,984. Brunck. *See under VII.*
- " 24,040. Crawford. Treatment of peat for fuel. Nov. 7.
- " 24,242. Arzt and Baron. Gas for illuminating and heating purposes. Nov. 9.
- " 24,348. Winkler. Incandescent light mantles. Nov. 9.
- " 24,293. Breckon. Method of producing superior coke in connection with gas works and the like.* Nov. 10.
- " 24,308. Redman and Redman. Inclined retorts. Nov. 10.
- " 24,333. Desgraz. Process and apparatus for obtaining producer gas free of tar and of high calorific value.* Nov. 10.
- " 24,336. Carpenter and Davis. Artificial composition fuel. Nov. 10.
- " 24,400. Sutton and Radd. Incandescent gas mantle. Nov. 11.
- " 24,467. Kirkham, Hullett, and Chandler, Ltd., and Hersey. Apparatus for washing and scrubbing gas. Nov. 11.
- [C.S.] 24,995 (1903). Little. Inclined gas retort beds. Nov. 9.
- " 28,342 (1903). Bell and Masters. Furnaces of gas producers. Nov. 9.
- " 28,498 (1903). Bowing. Manufacture of combustible gas. Nov. 9.
- " 544 (1904). Armstrong. Manufacture of producer gas, and apparatus therefor. Nov. 9.
- " 4995 (1904). Schlickeysen. Process for converting raw peat into solid peat fuel. Nov. 16.
- " 16,766 (1904). Colson. Manufacture and purification of illuminating gas. Nov. 9.
- " 21,318 (1904). Neuman. Combined double gas producers and steam generators for producing water gas and producer gas, and generating steam by the heat of such gases. Nov. 16.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM, AND MINERAL WAXES.

- [A.] 23,680. Rud. Böttgers Chem. Fabr.f. Theerprodukte. Treatment of heavy tar oils for the manufacture of pitch or of a special kind of tar. [Ger. Appl., July 1, 1904.]* Nov. 2.
- " 23,727. Kuess. Process for transforming into soap mineral oils in general and petroleum in particular. [Fr. Appl., Nov. 3, 1903.]* Nov. 2.
- " 24,297. Gittings. Manufacture of volatile oils. Nov. 10.
- " 24,554. Scholviën. Manufacture of benzenes, and hydroxyl derivatives of the same. [Ger. Appl., May 27, 1904.]* Nov. 12.
- [C.S.] 26,366 (1903). Lothammer and Trocquet. Process for saponifying petroleum and other like hydrocarbons. Nov. 9.

IV.—COLOURING MATTERS AND DYE STUFFS.

- [A.] 24,045. Newton (Bayer and Co.). Manufacture of new azo dyestuffs. Nov. 7.
- [C.S.] 26,379 (1903). Johnson (Kalle and Co.). Manufacture of black sulphur dyes. Nov. 16.

V.—PREPARING, BLEACHING, DYING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

- [A.] 23,426. Shearer and O'Brien. Processes for retting flax or degumming rees, ramie, or china grass. Oct. 31.
- " 23,493. McNaught. Wool washing machines. Oct. 31.
- " 23,635. Walker (Kestner). Ageing or conditioning yarn and the like. Nov. 2.
- " 23,647. Graham and Cope. Preparation for bleaching cotton and other vegetable fibres. Nov. 2.
- " 23,651. Wray and Wray. Apparatus for spraying and conditioning yarn. Nov. 2.
- " 23,861. Stillie. Dyeing woollen goods. Nov. 4.
- " 23,950. Lye and Lye. Dyeing wool, hair, cotton, and linen fibres in sliver, yarn, or thread, and apparatus employed therein. Nov. 5.
- " 24,307. Robertson. Process of dyeing cotton and linen in mixture, textiles, goods, &c., composed of wool and cotton; wool, cotton, and linen; wool, silk, and cotton; and wool, silk, cotton, and linen. Nov. 9.
- " 24,285. De Keukelaere. Machine for dyeing and otherwise treating textile materials. Nov. 9.
- " 24,329. Mycock. Process of producing figured indigo dyed textile fabrics. Nov. 10.
- " 24,412. Owens. Machine for dyeing or otherwise treating fibrous material in cop or other compact form. Nov. 11.
- " 24,505. De Naeyer. The dyeing or otherwise treating with liquor of textile materials in rolls, spools, cheeses, or the like. [Appl. in Belgium, Nov. 26, 1903.]* Nov. 12.
- " 24,545. Spivey. Apparatus for distributing oil or other liquid upon fibres. Nov. 12.
- [C.S.] 24,666 (1903). Tomlinson (Haas and Haas). Apparatus for treating textile piece goods with air or other gas or vapours for dyeing, bleaching, carbonising, or other processes. Nov. 16.
- " 25,891 (1903). Wood, Secombe, and Lang Bridge, Ltd. Cotton printing machines. Nov. 16.
- " 51 (1904). Morton. Manufacture of figured fabrics. Nov. 16.
- " 18,485 (1904). Thompson (Wickels Metallpapierwerke G.m.b.H.). Method of producing a silky appearance on cotton and other fabrics. Nov. 9.
- " 18,330 (1904). Beckmann. Machines for finishing fabrics. Nov. 9.
- " 21,793 (1904). Hofmann. Machines for printing yarns in several colours. Nov. 16.

VI.—COLOURING WOOD, PAPER, LEATHER, ETC.

- [A.] 24,456. Soc. C. et R. Chapal Frères et Cie. Machines for dyeing furs and carotting skins. [Fr. Appl., Nov. 14, 1903.]* Nov. 11.

VII.—ACIDS, ALKALIS, AND SALTS.

- [A.] 23,465. Hunter. Apparatus for use in the manufacture of carbonic acid gas. Oct. 31.
 " 23,473. Gibbs. *See under IX.*
 " 23,515. Johnson (Badische Anilin und Soda Fabrik). Manufacture of stable hydrosulphites. Oct. 31.
 " 23,984. Brunck. Extraction of ammonia from distillation gases. Nov. 5.
 " 24,014. Taylor. Recovery of mineral acids and other products from residual liquors containing iron. Nov. 7.
 " 24,156. Davis and Davis. Treatment of galvanisers' "waste" or "spent" pickle and obtaining useful products therefrom. Nov. 8.
 " 24,198. Howles, McDougall, and McDougall. Utilisation of crude sulphides of arsenic. Nov. 8.
 " 24,328. Gittings. Oxidising and deoxidising agents. Nov. 10.
 [C.S.] 26,148 (1903). Jaubert. Preparation of oxygen. Nov. 16.
 " 28,585. (1903). Tixier, Cambier, and Adnet. Manufacture of a barium permanganate. Nov. 9.

VIII.—GLASS, POTTERY, AND ENAMELS.

- [A.] 24,199. Frugier. Process and apparatus for disintegrating kaolinic stone and the like, and for separating the constituents thereof. [Fr. Appl., Nov. 9, 1903.]* Nov. 8.
 [C.S.] 20,879 (1904). Bredel. Manufacture of quartz glass from quartz, sand, silica, and the like. Nov. 9.
 " 20,880 (1904). Bredel. Manufacture of articles from quartz glass. Nov. 9.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

- [A.] 23,473. Gibbs. Decomposing refractory silicates. [U.S. Appl., Oct. 30, 1903.]* Oct. 31.
 " 23,492. Gacon. Manufacture of artificial emery.* Oct. 31.
 " 23,587. Johnson. Manufacture of cement. Nov. 1.
 " 24,426. Hamblet. Brick kilns and the like. Nov. 11.
 " 24,451. Boulé (Hülsberg und Co.). Impregnation of wood and other porous materials. Nov. 11.
 " 24,589. Burnet. Treatment of wood and other porous material for rendering it non-porous and impermeable to the passage of fluids. Nov. 12.
 [C.S.] 23,786 (1903). Gare. Solutions for treating wood and other fibrous and porous materials or compounds. Nov. 9.
 " 28,731 (1903). Middleton. Process of manufacturing refractory material. Nov. 9.
 " 28,733 (1903). Thompson. Manufacture of bricks, tiles, slabs, &c. Nov. 9.
 " 4275 (1904). Nelson. Manufacture of slag wool, silicate cotton, or mineral wool. Nov. 9.
 " 15,057 (1904). Muller. Manufacture of a pulverulent product for coating and joining masonry or brickwork of furnaces, ovens, pipes, retorts, and the like. Nov. 16.

X.—METALLURGY.

- [A.] 23,436. Angel. Concentration of zinc and other metals from sulphide ores. Oct. 31.
 " 23,508. Weiller and Weiller. Process for extracting copper from its ores. Oct. 31.
 " 23,713. Dupré (Dupré). Process for dissolving gold. Nov. 2.
 " 23,826. Davies and Clark. Metallurgical furnaces. Nov. 8.
 " 23,906. Schwarz. Process for extracting metal from ores, and apparatus for performing same.* Nov. 4.

- [A.] 23,909. Barber (Kingsley). Apparatus for and process of treating sulphide and other ores.* Nov. 4.
 " 24,082. Tresidder. Manufacture of steel. Nov. 7.
 " 24,186. Angel. Reduction of sulphide ores and recovery of the metals therefrom. Nov. 8.
 " 24,175. De Dion and Bouton. Manufacture of nickel steel. [Fr. Appl., July 17, 1904.]* Nov. 8.
 " 24,231. Harvey and Wilson. *See under I.*
 " 24,232. Bayliss, Jones, and Bayliss, Ltd., and Milner. Method of melting pig iron in puddling furnaces. Nov. 9.
 " 24,445. Witter. Process of obtaining and utilising tin from tin slags. Nov. 11.
 " 24,563. Rouse and Cohn. Briquetting manganese ores or oxides and mixtures of manganese ores and iron ores. Nov. 12.
 " 24,585. Blenkinsop. Treatment of copper ore.* Nov. 12.

- [C.S.] 23,861 (1903). Soc. Anon. La Neo-Métallurgie. Alloy. Nov. 16.
 " 27,172 (1903). Cowper-Coles and Co., Ltd., and Cowper-Coles. Hardening of metals and alloys. Nov. 16.
 " 28,464 (1903). Edwards. Furnaces for calcining or roasting mineral ores and desulphurising the same. Nov. 9.
 " 268 (1904). Brand. Extraction of zinc. Nov. 9.
 " 3628 (1904). Brand. Extraction of zinc. Nov. 9.
 " 4706 (1904). Cunningham. Extraction and purification of zinc. Nov. 16.
 " 14,985 (1904). Cie. du Réacteur Métallurgique. Manufacture of steel and treatment of copper, nickel, and like matts. Nov. 16.
 " 20,159 (1904). Gillies. Apparatus for separating and recovering sulphides from their ores. Nov. 9.
 " 20,468 (1904). Duncan. Manufacture of steel. Nov. 9.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

- [A.] 23,622. Möllmann. Galvanic batteries.* Nov. 1.
 " 23,765. Rudenick. Insulating material for electro-technical purposes. Nov. 3.
 " 23,768. Wilson, and the East Anglian Engineering Co., Ltd. Electro-magnets for extracting magnetic impurities from liquefied materials. Nov. 3.
 " 24,286. Cowper-Coles. Anodes. Nov. 9.
 [C.S.] 18,489 (1904). Schnelle. Process of and apparatus for the electrical separation of granular material. Nov. 9.

XII.—FATTY OILS, FATS, WAXES, AND SOAP.

- [A.] 23,448. British Oil and Cake Mills, Ltd., and Pearson. Treatment of linseed oil. Oct. 31.
 " 23,727. Kuess. *See under III.*
 " 24,023. Boardman. Manufacture of soap. Nov. 7.
 " 24,100. Garrigues. Processes for the recovery of glycerin from spent soap lye, and apparatus therefor. Nov. 8.
 " 24,375. Hunter. *See under XVII.*
 " 24,440. Holoubek. Manufacture of soap, and apparatus therefor. Nov. 11.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, ETC.

(A.)—PIGMENTS, PAINTS.

- [A.] 23,915. Scott. Machine for the manufacture of white lead, and for use in similar processes.* Nov. 5.
 " 24,238. Gebr. Heyl und Co., and Wultze. Process for manufacturing white lead. [Ger. Appl., June 11, 1904.]* Nov. 9.

(C.)—INDIA-RUBBER.

- [A.] 24,105. Livesay. Vulcanisers. Nov. 8.
 " 24,330. Gittings. Manufacture of india-rubber. Nov. 10.

XIV.—TANNING; LEATHER, GLUE, SIZE, Etc.

- [A.] 23,569. Lauch and Voswinkel. *See under XX.*
 „ 23,619. Notelle and Leroux. Method of treating corneous substances. Nov. 1.
 24,408. Fell. Treatment or finishing of hides or skins. Nov. 11.
 „ 24,456. Soc. C. et E. Chapal Frères et Cie. *See under VI.*

XV.—MANURES, Etc.

- [A.] 23,850. Seaman. Scheme to preserve and use bacteria for fertilisers. Nov. 4.
 [C.S.] 494 (1904). Myers. Manufacture of a fertiliser or manure. Nov. 16.

XVI.—SUGAR, STARCH, GUM, Etc.

- [A.] 24,374. King (Bertels). Process for the separation of alkaline salts contained in sugar-juice and the subsequent extraction of crystallisable sugar. Nov. 10.

XVII.—BREWING, WINES, SPIRITS, Etc.

- [A.] 23,597. Bübsam. Processes of preparing beer wort. Nov. 1.
 „ 24,368. Hower. Process for infusing and extracting hops. Nov. 10.
 „ 24,375. Hunter. Method of and means for treating or purifying wines, spirits, or the like; applicable also to oils and certain other substances. Nov. 10.
 [C.S.] 5774 (1904). Mead. Apparatus for use in fining malt liquors. Nov. 16.

XVIII.—FOODS; SANITATION, WATER PURIFICATION; & DISINFECTANTS.**(A.)—FOODS.**

- [A.] 23,616. Fulda. Preserving animal food substances. Nov. 1.
 „ 24,174. Overbeck. Method of separating arsenic from liquid food materials, whether used as a liquid or treated or combined with other material to produce a more or less solid food. Nov. 8.
 „ 24,430. Mitchell. Producing proteid. Nov. 11.
 „ 24,527. Mitchell. Process for the production of proteid. Nov. 12.
 [C.S.] 6720 (1904). Rayner (Maemecke). Manufacture of milk powder. Nov. 16.

(B.)—SANITATION; WATER PURIFICATION.

- [A.] 23,640. Spence, Spence, and Peter Spence and Sons, Ltd. Treatment of sewage and other similar sludges. Nov. 1.
 „ 23,641. Spence, Spence, and Peter Spence and Sons, Ltd. Treatment of certain waste waters. Nov. 1.
 „ 23,747. Bolton and Mills. Apparatus for the automatic filtration or treatment of sewage or other impure liquid. Nov. 8.
 „ 23,924. Spence, Spence, and Peter Spence and Sons, Ltd. Treatment of certain waste waters. Nov. 5.
 [C.S.] 20,889 (1904). Kremer and Schilling. Method of and apparatus for the bacterial purification of sewage and the like. Nov. 9.
 „ 21,777 (1904). Schou. Water-purifying apparatus. Nov. 16.

(C.)—DISINFECTANTS.

- [A.] 23,463. Hawliczek. Disinfectant and detergent compounds. Oct. 31.
 „ 24,015. The Scottish Peat Industries, Ltd., and Meilke. Disinfecting powders. Nov. 7.
 [C.S.] 16,715 (1904). Woollard and Batten. Insect destroyer and disinfectant powder. Nov. 9.

- [C.S.] 21,053 (1904). Morgan. Method and process of disinfecting. Nov. 9.

XIX.—PAPER, PASTEBOARD, Etc.

- [A.] 24,083. Johnson (Badische Anilin und Soda Fabrik). Manufacture of acetylated cellulose. Nov. 7.
 [C.S.] 27,788 (1903). Strange, Garle, and Longdon. Treatment and utilisation of residual matters containing alkaline and organic substances, such as the residual matters resulting from the treatment of esparto grass, straw, wood, and the like, with alkali in the preparation of paper pulp. Nov. 16.
 „ 21,101 (1904). Birkbeck (Brooks). Process of making a substitute for cork. Nov. 9.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

- [A.] 23,569. Lauch and Voswinkel. Manufacture of condensation products from tannin like substances and urea by means of formaldehyde.* Nov. 1.
 „ 23,578. Knoevenagel. Manufacture of odoriferous compounds or perfumes. [Ger. Appl., Nov. 10, 1903.]* Nov. 1.
 „ 23,729. Lutke, Arndt, und Löwengard. Preparation of condensation products from *p*-aminophenol with aldehydes.* Nov. 2.
 „ 23,974. Abel (Act.-Ges. f. Anilinfabr.). Manufacture of *o*-xybenzene carboxylic acid esters of the phenyl or naphthyl series. Nov. 5.
 „ 24,297. Gittings. *See under III.*
 „ 24,298. Gittings. Manufacture of menthol and camphor. Nov. 10.
 „ 24,494. Dakin. Manufacture of a chemical substance and of allied bodies and intermediate products. Nov. 11.
 „ 24,536. Ewan and Young. Manufacture of guanidine salts. Nov. 12.
 [C.S.] 24,631 (1903). Fournau. Preparation of amino alcohols and their derivatives. Nov. 16.
 „ 449 (1904). Fehrlin. Production of compounds of pyrocatechuemonoalkylethers, and especially of guaiacol and guaethol with protein substances. Nov. 9.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

- [A.] 23,766. Höchheimer. Photographic pigment paper. Nov. 3.
 „ 23,900. Bognuerts. Reproduction of pictures. Nov. 12.
 „ 24,235. Crocker. Method of photography. Nov. 9.
 „ 24,290. Koppmann. Process for producing coloured photographs. Nov. 9.
 „ 24,311. Gittings. The art of photography. Nov. 10.
 [C.S.] 808 (1904). Riebenschalm and Koppmann. Process for producing coloured photographs. Nov. 16.
 „ 20,934 (1904). Schmidt. Arrangement of films and filters for three-colour photography. Nov. 9.

XXII.—EXPLOSIVES, MATCHES, Etc.

- [A.] 23,973. Mitchell. Explosives.* Nov. 5.
 „ 23,986. Carter and The New Explosives Co., Ltd. Manufacture of compressed gun-cotton. Nov. 5.
 „ 24,223. Hargreaves, and Curtis's and Harvey, Ltd. Blasting compounds. Nov. 9.
 [C.S.] 21,481 (1903). Bowen. Explosives. Nov. 16.
 „ 21,482 (1903). Bowen. Explosives. Nov. 16.
 „ 28,710 (1903). Russell. Explosives for blasting or like purposes. Nov. 9.
 „ 20,106 (1904). Evangelidi. Explosives. Nov. 9.
 „ 21,204 (1904). Soc. de la Poudre Peigne et des Brevets J. Luciani. Manufacture of gunpowder. Nov. 16.

JOURNAL OF THE Society of Chemical Industry.

A RECORD

FOR ALL INTERESTED IN CHEMICAL AND ALLIED MANUFACTURES.

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Official Notices.

NEW SECTION FOR NEW ENGLAND, U.S.A.

The Council has granted the application of eighty members of the Society residing in the States of Maine, New Hampshire, Vermont, Connecticut, Rhode Island, and Massachusetts, to be allowed to form a section, to be called the New England Section of the Society.

THE JOURNAL.

From the beginning of next year the Society's Journal will be printed and published by Messrs. Vacher and Sons, Great Smith Street, Westminster, S.W., to whom all communications regarding subscribers' copies and advertisements should be sent.

SUBSCRIPTIONS FOR 1905.

Members are reminded that the subscription of 25s. for 1905, payable on January 1st next, should be sent in good time to the Hon. Treasurer (Mr. Samuel Hall), in order to ensure continuity in the receipt of the Society's Journal. Any changes of address to appear in the new List of Members now in course of preparation should reach the General Secretary not later than January 15th, 1905.

COMMUNICATIONS.

Authors of communications read before the Society, or any of its Local Sections, are requested to take notice that under Rule 43 of the Bye-laws the Society has the right of priority of publication for three months of all such papers. Infringement of this Bye-law renders papers liable to be rejected by the Publication Committee, or ordered to be abstracted for the Journal, in which case no reprints can be furnished to the author.

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- Drown, Prof. T. M., Lehigh University, South Bethlehem, Pa., U.S.A. Nov. 16.

Annual General Meeting,

NEW YORK, 1904.

DETROIT, MONDAY, SEPT. 26TH.

While in Detroit the members were the guests of Messrs. Parke, Davis, and Co. On arrival they were received by Mr. Parker (of the City department of the firm) and Mr. F. M. Fisk (the London representative), and taken to the Russell House, where breakfast was served. They were then conveyed in trolley-cars to the factory, where they were received by Mr. E. G. Swift, general manager; Mr. J. C. Spratt, business manager; Dr. F. G. Ryan, chief of the manufacturing department, and others of the directors. The factory is situated on the river front, with plenty of space, the research laboratory being in a handsome detached building surrounded by lawns, and the biological stables separated from the works by a road. Across the

river is Canada, where, within sight, the firm has another factory. Groups of ten, conducted by one of the heads of departments, were shown round the pill department—cutting, forming the mass, drying, sugar and gelatin coating, manufacture of globules; and the tablet department—compressing, triturating, and coating. Fire drill then took place in the inner courtyard on a preconcerted signal, whereon all workmen left their tasks, and proceeded to allotted posts without confusion or disorder. The visitors then proceeded through the hypodermic tablet and correspondence departments to see the manufacture of glassware (including vaccine points, serum bulbs, and hypodermic tubes), paper boxes, granular effervescent salts, lozenges, and tablet milling and granulating. Next came the drying of digestive ferments, and the binding and mailing of the firm's literature. After the crude drug and pressed herb, milling and printing departments had been inspected, the chemical department was shown, in which the preparation of digestive ferments, extracts, percolates, and soluble elastic capsules is carried on, finishing with the pharmaceutical department and power plants (electricity, compressed air). The stock, finishing, bottle-washing, and shipping departments came next, and then the party assembled on the river front to see the City fireboat throw 5000 galls. of water a minute. In the Scientific Building, of which Drs. McClintock and Houghton are directors, the departments of analysis and experimental medicine were thrown open for inspection. Behind glass partitions trained assistants were seen preparing, finishing, and filtering serums in special aseptic rooms. One of the laboratories in the Department of Experimental Medicine is devoted almost exclusively to the work of testing different antiseptics for germicidal power.

This property can be accurately determined by exposing cultures of the *Bacillus pyocyaneus*, the most resistant of vegetative forms of bacteria, to the action of certain dilutions of the disinfectant to be tested, transferring such cultures from the disinfectant to plain bouillon, in which the result, after a suitable period of incubation, is noted. In this manner a certain standard can also be established to which disinfectants must conform before being placed upon the market.

Physiological Testing of Adrenalin.—In determining the activity of solutions of adrenalin or other suprarenal extracts, the almost immediate characteristic rise in blood pressure peculiar to this drug, when injected intravenously, is taken as the index of its activity. This rise in blood pressure can be made quantitative by measuring the height to which a certain weight of mercury is raised by the action of a definite amount of adrenalin.

Standard and sample to be tested are injected alternately into the veins of an animal, the dose of the sample being changed if necessary until the rise in blood pressure caused by each is the same. The delicacy of a physiological test is well illustrated by the effect of minute quantities of adrenalin on the blood pressure. An appreciable change in the blood pressure can be induced by a difference of 3 per cent. in the amount used, equal to 0.0000003 grm. of pure adrenalin.

The biological stables, the vaccine-propagating rooms, operating room, guinea-pig loft, and dog and rabbit cages were visited, and, in the horse-operating room, Dr. Duncleley, the firm's veterinary surgeon, injected toxin into one horse, and had another brought in to show the mode of drawing off the blood into sterilised tubes.

The party then returned to the Russell House, where luncheon was provided, at which the Mayor of Detroit (the Hon. Wm. Mayberry) made an eloquent speech. The afternoon was passed in driving in four-in-hand coaches, through the boulevards and suburbs of the city to Belle Isle, an island park of great beauty. The day's hospitality concluded with a dinner at the Russell House, at which were present the chief officers of the company and principal members of the staff. Prof. A. B. Prescott and Prof. Campbell, of the University of Michigan, Sir Wm. Ramsay, Prof. Erdmann, Prof. V. Coblentz, Dr. Lewkowitsch, Mr. Thos. Tyrer, and Mr. Eustace Carey spoke on behalf of the guests, and Mr. Swift and Mr. Spratt on behalf of Messrs. Parke, Davis, and Co. Dr. Ryan acted as toastmaster.

NIAGARA AND BUFFALO, TUESDAY, SEPT. 27TH.

BUFFALO AND NIAGARA FALLS RECEPTION COMMITTEE

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On arrival at Niagara Falls, each visitor was presented with a copy of "The Niagara Falls Electrical Handbook," published under the auspices of the American Institute of Electrical Engineers for the guidance of visitors from abroad attending the International Electrical Congress at St. Louis. It contained authoritative information concerning Niagara Falls, the numerous power developments on both sides of the river, and the various industries. After breakfast at the International Hotel, the Gorge Railway trolley cars were taken for a trip down the Niagara Gorge, past the Whirlpool Rapids on the American side, to Lewiston, thence across the bridge to the Canadian side, and back along the Gorge to Queen Victoria Park. Here lunch was provided by the Canadian Section in the new refectory.

After luncheon the two great power houses of the Niagara Falls Power Company were visited. These give a total of 100,000 horse power from water taken from the Niagara River, a mile above the falls, on the American side. All this is sold, at from 4¢. to 5¢. per horse power, to industries in Niagara, Buffalo, Tonawanda, and Lockport; other schemes are in progress on the Canadian side. Then the International Acheson Graphite Co.'s plant, with the highest temperature electric furnaces in existence, was visited. In the evening another trip was made down the gorge, preceded by a search-light car, which illuminated the rapids in various colours.

WEDNESDAY, SEPT. 28TH.

The power-house of the Niagara Falls Hydraulic Power and Manufacturing Co.—which works a railway of 360 miles, the tramway running round the gorge, all the trolley lines in the district, all the street lighting, and the chief electrolytic plants—was visited. Some went also to the Natural Food Co.; others visited the islands above the falls, the Cave of the Winds, or viewed the falls from the steamer "Maid of the Mist."

At 11.15 the train left for Buffalo, where the visitors were received enthusiastically and entertained at the Ellicott Club. Then they went on board special fireboats in order to inspect the harbour and the new Lackawanna steel plant, the largest in the world. On their way back they landed for a while on the gigantic breakwater, which protects Buffalo from the storms which occasionally affect Lake Erie, and here saw an exhibition of fire practice. The Larkin Soap Co.'s works were also opened to the members of the Society. On their return they were received at the Buffalo Club, where many of the most prominent ladies and gentlemen in the city assembled to honour the Society.

The Society is particularly indebted to Mr. Chas. E. Acker, Chairman of the Reception Committee; to Mr. E. B. Stevens, President of the Niagara Research Laboratories; Dr. Roswell Park; Mr. Chas. W. Goodyear; Mr. H. M. Poole, President of the Ellicott Club; Mr. Pendennis White, President of the Buffalo Club; Mr. Francis D. Ward, Commissioner of Public Works; and Dr. Lee H. Smith, all of Buffalo, for the hearty reception given to the members.

BOSTON, THURSDAY, SEPT. 29TH.

RECEPTION COMMITTEE.

Godfrey L. A. Cabot, Chairman.

Henry Howard, Secretary.

W. H. Walker, Treasurer.

F. E. Atteaux.
E. F. Billings.
A. L. Cochrane.W. J. Webber.
Henry Wood.

Ladies' Committee.

Mrs. Charles Eliot.
Mrs. Edgar F. Billings.
Mrs. Henry Howard.Mrs. W. H. Walker.
Mrs. W. J. Webber.

On arrival the members and ladies were conveyed to the Hotel Somerset, the headquarters. After breakfast they inspected the laboratories of the Massachusetts Institute of Technology, so long associated with the name of the late Prof. T. M. Drown. The Public Library, with its staircase embellished by the frescoes of Puvis de Chavannes; the lending room, with its frieze illustrating the "Quest of the Holy Grail," by Abbey; and the upper gallery, decorated by Sargent; and the Art Gallery, were also visited.

Thence they proceeded to Harvard University, Cambridge, Mass., where they were welcomed by President Eliot, formerly Professor of Chemistry at the Mass. Inst. of Technology, and Prof. T. W. Richards. After lunch the principal laboratories and buildings were shown. In the museum there is a remarkable collection of reproductions of flowers in glass, given in memory of Dr. C. E. Ware, and made by Messrs. Leopold and Rudolph Blaschka, of Austria. Additions are constantly being made to this collection, which is said to be entirely a labour of love on the part of the makers.

On leaving the University the members started to drive through the parks and environs of Boston to the Country Club, but were overtaken by a storm, and were reluctantly compelled to abandon the excursion.

At a smoking concert at the Hotel Somerset, in the evening, Sir Wm. Ramsay presented, on behalf of the visiting members, addresses and a small memento, in the shape of a gold match-box, to the following gentlemen, on whom had fallen the organisation and conduct of the tour:—Dr. L. Baekeland, Prof. M. T. Bogert, Prof. V. Coblenz, Dr. E. G. Love, Dr. B. W. Moore, Mr. T. J. Parker, Dr. H. Schweitzer, Mr. R. C. Woodcock, and Mr. C. B. Zabriskie. A silver cigarette case was also presented to Mr. H. C. Bates, the agent of the Pennsylvania Railroad, in recognition of his courtesy and attention.

FRIDAY, SEPT. 30TH.

Parties of members visited the works of the Merrimac Chemical Co. and the Cochrane Chemical Co., both of which manufacture heavy chemicals; the New England Coke and Gas Co., with its 500 coke ovens of the Otto-Hoffman type; the Hamilton Print Works, where also all kinds of cotton goods are manufactured, bleached, and dyed; and the Douglas Shoe Co., which makes 10,000 pairs per day.

The New England Gas and Coke Co.—To Mr. Henry M. Whitney, of Boston, chiefly belongs the credit of the inception of this enterprise. From a very inferior coal, which could be very cheaply mined, it was proposed to obtain a merchantable coke containing little sulphur and a large amount of gas, for which there was an immediate sale in the neighbourhood of Boston. It was then proposed to associate this enterprise with the Massachusetts Pipe Line Co., which possessed rights of way all over the State of Massachusetts. Coke ovens, to the number of 400, were erected, agreements effected with adjoining companies, and the by-products were worked up in the immediate vicinity by subsidiary companies. After a period of considerable stress, the gas interests of Boston and the surrounding districts were brought under one management, and the experiment is now to be tried of conducting and selling coke-gas made from by-product ovens to communities at a considerable distance for fuel and light, and recovering the ammonia, tar, and other by-products.

In the afternoon the members and ladies assembled at the Point Shirley Club, at the seaside, near Boston Harbour, to partake of a clam-bake, cooked by a method which is a survival of an aboriginal custom before cooking utensils were introduced. The bake was served at 5 o'clock. Mr. F. E. Atteaux was toastmaster, and Sir Wm. Ramsay. Dr. Wm. H. Nichols, Prof. H. Walker, Mr. W. Henry Howard, and Mr. Armstrong were among the speakers. The party then broke up, some returning to New York, and others going on to Canada.

On Oct. 4th, Columbia University conferred the degree of D.Sc. on Sir Wm. Ramsay and Dr. Wm. H. Nichols. In the evening Sir Wm. Ramsay was entertained at a banquet by the Brooklyn Institute of Arts and Sciences. Prof. Irving W. Fay presided, and among those who sat at the guest table were Prof. C. F. Chandler, Dr. H. W. Wiley, Dr. F. W. Atkinson (President of the Brooklyn Polytechnic Institute), Prof. John S. McKay, Dr. Wm. H. Nichols, Mr. Fred B. Pratt, and the Rev. Dr. S. Parkes Cadman.

On Oct. 5th, Sir Wm. Ramsay and many members and ladies sailed for England by the s.s. "Baltic."

On Oct. 7th, a meeting of the New York Section of the American Chemical Society was held, preceded by a dinner at the Hotel Savoy, to which the members of the Society were invited. Dr. F. D. Dodge was in the chair, and papers were read by Messrs. Chas. Baskerville and Fritz Zerbán on "Inactive Thorium," and by Mr. D. D. Jackson on the "Use of Copper Sulphate as an Algæcide in the Treatment of Water Supplies." Dr. J. Lewkowitsch also delivered an address on the "Recent Advances in the Chemistry of Fats."

Canadian Section.

Meetings held at Toronto, on Oct. 27th and
Nov. 24th, 1904.

DR. F. J. SMALE IN THE CHAIR.

A discussion on "Smoke Consumers and Flue Gases" was introduced on Oct. 27th by Dr. W. B. Coboc and Mr. Jas. Milne, after which the subject was thrown open for general discussion.

On Nov. 24th a discussion took place on "Boiler Waters and Compounds," in which Profs. Ellis and Lang, Drs. Allan and Kenrick, Messrs. Taylor, Van der Linde, Bain, Murray, and Sparrow, and the Chairman took part. The meeting was well attended.

The aim of the Committee has been to make such a selection of subjects as will be of general interest to manufacturers. Among other papers promised are: "Producers and Gas Engines," "Food Preservatives," and "Manufacture of Artificial Silk."

Newcastle Section.

Meeting held in the Chemical Lecture Theatre of the
Armstrong College, Thursday, October 20th, 1904.

CHAIRMAN'S ADDRESS.

THE FUSION OF REFRACTORY MATERIALS.

BY J. T. DUNN, D.Sc.

Refractory materials have an important bearing upon many branches of chemical and metallurgical industry; and

with the progress of these industries greater demands are continually being made upon such materials. Furnaces and crucibles have to resist higher temperatures and the attack of more vigorous reagents; processes are conducted for longer periods continuously, and larger balks of material, involving larger apparatus, and consequently increased pressure on its walls, are dealt with. Hence the testing of the materials of which furnaces, crucibles, retorts, &c. are made, is becoming a matter of wider scope, and one requiring more care and attention than was formerly the case.

Many things are required of a refractory material; and the nature of these requirements naturally varies with the particular service which it has to serve. One of the most important, and the most general, is of course that it should resist a high temperature without softening or melting; and the determination of the melting points of fireclays, silica bricks, and similar substances, is consequently a matter of some importance. To this point I propose to confine myself to-night.

It is perhaps hardly necessary to say that the basis of clays, kaolinite or "claystuff," is a silicate of aluminium having approximately the composition represented by $\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2 \cdot 2\text{H}_2\text{O}$; and that china clay, consists of practically pure kaolinite, while other clays contain in addition small amounts of other silicates or metallic oxides—those of iron, manganese, calcium, magnesium, and the alkalis—together with more or less mechanically mixed sand or other mineral fragments. It was early recognised that great differences in refractoriness or fusibility existed among clays; and as, on the whole, the more impure clays were found to be the more easily fusible, the idea gained ground that the fusibility of a clay depended entirely upon the percentage of these foreign silicates or oxides, which were hence spoken of as "Flussmittel" or "fluxing-stuff." The relative refractoriness of a clay was thus estimated from the amount of these "fluxing-stuffs" which chemical analysis showed to be present. Cases which contradicted this assumption, however, were not long in accumulating; and Bischof about 1860 undertook an experimental investigation into the question. He heated in a wind furnace silica, alumina, kaolin, and mixtures of this with alumina and with silica in various proportions, and determined their relative fusibilities. While recognising the influence of the "fluxing-stuffs" in a clay upon its melting-point, he came to the conclusion that the determining factor was the proportion of alumina, and that the greater the percentage of alumina a clay contained the more refractory would it be. He endeavoured to express the relative fusibilities of clays by "coefficients," calculated from the ratios between alumina and silica, and alumina and fluxing stuffs, shown by the analysis.

Richters, in 1868, published a long series of very carefully conducted experiments on the question, as a result of which he concluded that no one factor was determinative. While agreeing with Bischof, that of the pure aluminium silicates, those high in alumina were more refractory than those high in silica, he found that the fusibility increased, in a given clay, with increase of fluxing stuff: that quantities of different fluxing-stuffs proportioned to their chemical equivalents produced equal effects in lowering the melting point: that the effect of a mixture of different fluxing-stuffs was the sum of the separate effects that each constituent of the mixture would have produced alone; and that a given percentage of fluxing-stuff produced the greater effect in lowering the melting point, the greater the proportion of silica in the clay. He calculated from the analyses formulæ expressing the relative molecular proportions of alumina to silica, and of both to fluxing-stuff—formulæ of the type $x(\text{Al}_2\text{O}_3 \cdot y\text{SiO}_2) + \text{RO}$; such a formula gives, according to Richter's results, an indication of the fusibility of the clay, which is the more refractory as x is greater or as y is less.

Seger, in several of his early writings on the subject, emphasised strongly—what had indeed been recognised by Bischof and by Richters—the importance of the mechanical and "rational" analysis of the clay. He pointed out very clearly that a quantity of silica present as sand was by no means the same thing as an equal quantity already combined as silicate with the alumina present, and that the

nature of the sandy particles or mineral fragments intermixed with the clay stuff proper had a considerable influence on the fusibility of the clay. A clay (still more a brick, made of a mixture of the clay with small fragments of the already burnt clay, or with similar refractory materials) is not a homogeneous substance, but a mixture of substances, which not only have different melting points, but which are more or less capable when melted, by reacting on one another, to form new substances, the melting points of which are different from, and usually lower than, those of the original substances. Accordingly, when such a clay is heated, liquefaction begins at the melting point of the most fusible constituent; and if this be present in large proportion the substance will run down at this temperature to a liquid containing in suspension the solid particles of the less fusible constituents. If the latter predominate, however, they will form a solid framework which will preserve the original shape of the piece, and will hold in its interstices the liquefied portion, as a knob of sugar will hold a drop of water. But as the water will gradually dissolve sugar till saturated, and may cause the disintegration and flow of the whole lump; so the liquefied portions of the clay, kept at the same temperature, may act chemically upon the solid portions, and if in doing so they form more fusible compounds may lead to the ultimate liquefaction of the whole. The rate at which this will occur must obviously depend, not only on the chemical nature of the materials, but also the fineness of the grinding, and the more or less intimate mixture of the different constituents. It will thus be clear that two clays or bricks may glaze or vitrify on the surface at the same temperature, but that while one may gradually at that temperature, and very rapidly if the temperature be but slightly raised, liquefy completely, the other may remain practically solid till a much higher temperature is reached.

The practical determination of the melting-points of clays is a matter of considerable difficulty, on account of the high temperatures involved; and for the most part investigators have contented themselves with ascertaining the order of fusibility, and have not ventured to state definite melting-points in thermometric degrees. Bischof in his earlier experiments compared clays by determining for each the proportion of pure quartz sand with which it must be mixed in order that it should run down to a liquid at the same temperature as a standard refractory clay: the greater the amount of quartz sand needed for this the lower the melting-point of the clay. But this method assumed that the physical or mechanical support afforded by the quartz sand was not interfered with by the chemical action referred to above; and it was later abandoned by Bischof in favour of the method of comparison with normal or standard clays. He collected a series of seven standard clays, each very uniform in character, and each melting at a higher temperature than that which preceded it. Prisms of these and of the clay to be tested were heated together in a crucible in a wind-furnace till the test-piece melted; an examination of the standards, melted and unmelted, then enabled him not only to place the test between two, but as a rule to say whether it was nearer to that below or that above it in the series. Richters used a method externally similar to Bischof's earlier one, but used a temperature—that at which wrought iron melts—at which reaction between the clay and alumina, or the clay and silica, will occur. The clay to be tested was intimately mixed with varying quantities of alumina or of silica, according as preliminary experiments had shown that it was readily fusible or highly refractory; and prisms made of these mixtures were submitted to the given temperature for two hours—long enough for complete reaction to occur. The amount of alumina or of silica needed to produce a test piece, which, under this treatment became completely glazed over the surface—neither running down on the one hand nor remaining unchanged on the other—afforded a measure of the refractoriness of the clay. Seger greatly facilitated these determinations by the introduction of his "cones." These are mixtures of kaolin with quartz, alumina, felspar, and other materials, graduated in such a way as to form a series, the melting points in which rise from member to member. These are made into little narrow triangular pyramids a couple of centimetres high,

and the test-piece is heated in a crucible along with three or four of these, of melting-points above and below the expected melting-point of the clay. The principle is precisely similar to that of Bischof's method with standard clays, but the "cones" possess the advantages over the standard clays of being more closely graduated, of being reproducible indefinitely, and of thus allowing comparison between the results of different experimenters at different times and in different places. The melting-points of some of the cones have been compared by Hecht with the indications of the thermo-electric pyrometer; but the temperatures given for the higher cones are probably only rough approximations.

In my own practice I have hitherto used exclusively the Seger cones (or cones made from brick-clays the melting points of which had been previously determined by Seger cones) for ascertaining the melting points of clays and bricks; but I have been able to simplify and shorten the procedure very materially by using coal-gas and oxygen in the furnace. Bischof, Richters, and Seger used the Deville furnace, an air-blast furnace fed with coke or retort carbon. The temperature attained was roughly regulated by burning off at each operation a regulated weight of fuel; but this occupies a considerable time, the test-pieces cannot be examined during the operation, and the whole must be allowed to cool considerably before the crucible can be taken out and its contents examined. I have used with great advantage Fletcher's "oxygen injector" furnace. This is a small furnace with a modified "injector" burner, which is attached, however, not to an air-bellows, but to an oxygen cylinder. It is not an "oxy-coal-gas" burner, for the oxygen, issuing from the blowpipe-jet under considerable pressure, entrains with it a large quantity of air, so that the gas is burnt with enriched air, and the consumption of oxygen is very small in comparison with the effect produced. A certain amount of practice and experience are needed to obtain the best results with the burner; in my early attempts I was unable in an hour and a half, and with an enormous oxygen consumption, to melt a clay at all; but now I can readily reach a sufficient temperature in from three to five minutes, though such a rapid rise is not as a rule desirable. The body of the furnace is lined with a specially refractory clay, but it will not long stand the temperature attained, and I line my own furnace with magnesia, by simply ramming it full of calcined magnesia while the blow-pipe hole is corked, and then cutting and scraping out as much as necessary. The magnesia shrinks and cracks when heated, but by cautiously filling the cracks after each operation a lining is very soon obtained which is practically free from cracks, and which, though it is very tender and will stand no rough usage, will last for weeks or months if carefully treated, and is readily renewed if it does get destroyed. I have made many attempts to manufacture crucibles which would stand in the furnace, but hitherto have not been quite successful. I work usually with those made for the purpose by the "Laboratorium für Tonindustrie" in Berlin, and find them fairly satisfactory; but though they are the best thing I have yet been able to obtain, they soften and crack when a very refractory clay or silica brick is under treatment. I am, however, still working at this question. In an actual trial, a "cone" of the clay or brick under test is bedded in a little pure alumina in the crucible along with two or three of the Seger cones—say Nos. 27, 30, 33 for a totally unknown clay. The crucible is placed in the furnace, the lid put on, the furnace covered, and a small Télec or good-sized Bunsen burner allowed to heat the furnace up to its limit. In a quarter of an hour the furnace is red hot, and the Bunsen burner is replaced by the burner belonging to the furnace. Coal-gas and oxygen are regulated to get the best effect, and the temperature rises rapidly. After three or four minutes the gas and oxygen are turned off, the furnace cover is lifted, the crucible lid taken off, and the contents inspected. If the test-piece is not visibly affected, the lid and furnace-cover are quickly replaced, the gas and oxygen are turned on, and after one and a half or two minutes another inspection is made. This goes on till the test-piece is seen to be melting down, when the crucible is taken out, allowed to cool, and the test-piece carefully compared with the cones. It will be found quite easy to see that it is well below, well above, or very near to cone 30, say. A repetition of the experiment is then made with a

new test-piece and three consecutive cones, say 29, 30, and 31; at the end of this the position of the clay will be fixed as, say, between 30 and 31. A single determination is not enough, however; it should be repeated with the test-piece and the cones occupying different positions in the crucible, so as to eliminate errors due to unequal heating. With the arrangement I have described, however, though the outer surface of the crucible itself is hotter where the blast impinges on it than in other places, yet I have not found sensible differences (not as much as one cone difference, or say 20° C.) at different points in the crucible, save when cracks have formed and allowed entrance to the flame. Sometimes a cone or the test-piece falls against the side of the crucible and fuses into it; and sometimes the temperature rises with unexpected rapidity, and all the cones are found melted. In either of these cases a repetition of the experiment is, of course, necessary. Three or four experiments can, however, be carried out completely in the course of an hour, and when the four determinations agree, as they usually do, we are fairly certain of the result. With refractory clays, when the temperature nears the softening point of the crucible, more time is often needed, for it is then not always possible to lift the crucible lid, which is half fused to the crucible, and the crucible must be taken out, cooled, and broken before an inspection can be made; and in this case, if the experiment has not reached its end, a new beginning must be made. [A demonstration of the use of the furnace was here given.]

Naturally, many other circumstances besides its melting-point influence the suitability of a clay, a fire-brick, or a silica-brick for particular purposes. On another occasion I may have something to say in regard to some of these; but the determination of the melting-point is at least a first and an important criterion, for if the substance melts at too low a temperature any virtues it may possess in the way of mechanical strength or chemical resistivity are of no avail in high-temperature operations.

*Meeting held at Armstrong College, on Thursday,
November 17th, 1904.*

DR. J. T. DUNN IN THE CHAIR.

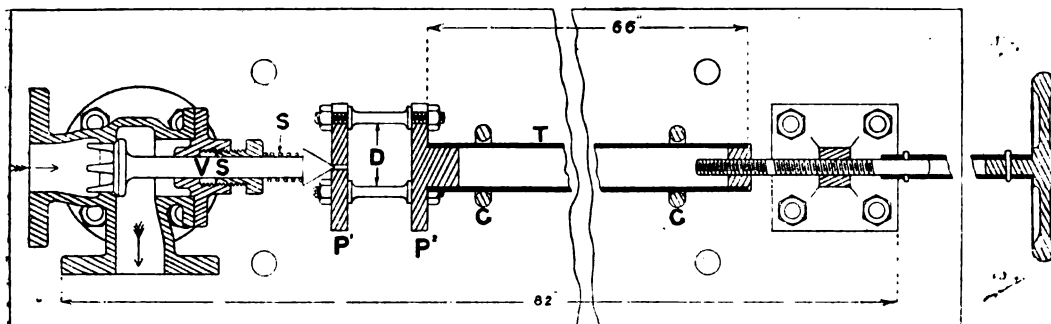
NOTES ON SOME TEMPERATURE REGULATORS.

BY WILLIAM H. SODEAU, B.Sc., F.I.C.

I. *A Steam Regulator with Expanding Tube.*—Five double-walled huts, each of about 400 cb. ft. capacity, had to be constantly maintained at different temperatures up to 60° C. by means of steam coils located beneath false floors. Each had been fitted with a commercial form of thermoregulator in which a 1½ in. nitre valve was controlled by the expansion of a zinc tube 66 ins. in length, directly connected to the valve spindle by means of a wooden insulator. Such a tube expands rather less than 0.002 in. for 1° C. rise of temperature; hence all connections in such a device must be free from any appreciable play in order that a slight rise of temperature may occasion a reduction of the opening of the valve, and *vice versa*. The baseboards of these regulators were, however, of wood, and the bolts passing through them were continually becoming slack, whilst the wooden insulators led to similar trouble. When the author took over the charge of these huts all the regulators had failed, from these and other defects, and the heating was being controlled by means of the external stop-valves.

Three of the regulators were reconstructed (Fig. 1) so as to ensure accurate action. In each, the baseboard was replaced by a slab of slate to which the parts were attached by means of steel taper bolts, having about the same coefficient of expansion as the slate. Conduction of heat from the valve to the tube was greatly reduced by fitting the end of the valve spindle VS with a steel conical cap, the point of which rested in a hole drilled through a circular steel plate P₁. A similar plate P₂ on the end of the zinc tube T was connected to P₁ by means of three steel distance pieces D, slipped into slots in the plates, stiff paper being used to prevent metallic contact. All play was taken up by

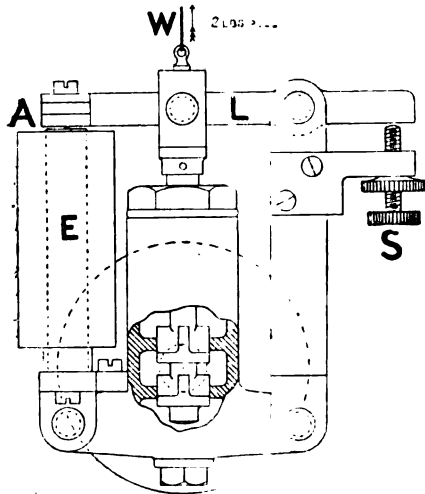
Fig. 1.



means of a stiff spiral spring S, coiled around the external portion of the valve spindle and tending to open the valve more fully whenever the zinc tube contracted on account of a fall of temperature. The zinc tube was supported by means of guides G, and was prevented from rotating by a pin sliding in a slot (not shown in the figure). The further end of the tube was adjusted by means of a differential screw (16 and 12 threads), one turn of which made an alteration of $\frac{1}{16}$ in., equal to 16° C. change of temperature. By means of a piece of gas pipe, this screw was connected to a handwheel outside the hut so that the setting could be altered without opening the door. Each regulator was connected to a pipe conveying steam, at a pressure of about 10 lbs. to the square inch, which had been passed through a separator in order to remove water and impurities which might tend to clog the valve.* These three regulators ran continuously for many months without giving any trouble. The temperature in each hut, as indicated by a long-stemmed thermometer having its bulb on the opposite side of the hut, was read every half hour throughout both day and night, and rarely varied more than $\pm 1^{\circ}$ C. from the intended reading. Any desired alteration of temperature could be rapidly effected by turning the handwheel to the appropriate extent as indicated above.

II. *An Electro-magnetic Steam Regulator* (Fig. 2).—The two remaining huts (see Section I.) were fitted with appliances constructed on a principle developed from that

Fig. 2.



of Scheibler's gas regulator. The lever, L, of a Dewrance 2 in. reducing valve was extended at the end connected to the link, so that a screw, S, might be used to prevent the valve from closing beyond a certain point at which the

* If any clogging should occur, the obstruction may be dislodged by turning the handwheel so as to permit the valve to open more fully for a few seconds.

amount of steam passing was just too little to maintain the hut at the desired temperature. To the opposite end of the lever was attached an iron cross-piece, A, forming the armature of an electro-magnet, E, fixed in the place where a dash-pot is sometimes fitted. The electro-magnet consisted of a pair of bobbins, each $3\frac{3}{4}$ ins. long by $1\frac{1}{2}$ ins. in diameter, wound with No. 22 S.W.G. double silk-covered wire. Each of the magnet poles ($\frac{3}{8}$ in. diam.) was provided with a small copper stud in the centre in order to prevent adhesion. By means of packing pieces the position of the magnet was adjusted until the amount of steam passing when the armature touched the magnet poles was markedly in excess of that required to maintain the temperature of the hut. The partial closing of the valve was brought about by means of a scale-beam and weight, which exerted a 2 lb. pull on a wire, W, directly connected to the valve spindle. It was found that under the actual conditions a movement of but little over $\frac{1}{16}$ in. at the valve spindle or $\frac{1}{8}$ in. at the armature was all that was required.

The electro-magnet was connected to two secondary cells in series with a relay. The relay was operated by means of a single dry-cell connected to the low temperature alarm contact of a long-stemmed creosote thermometer constructed on Sixe's principle. When the temperature fell contact was made, the relay circuit closed, and the armature pulled down to the magnet poles, the valve being thus opened more fully. On the temperature rising, contact was broken, and the valve once more closed to the minimum. The duration of the above cycle and the temperature range involved will of course depend largely upon the construction of the heating chamber and the closeness of the maximum and minimum positions of the valve. In a hut heated entirely by coils underneath a false floor the temperature range may be $\pm 1^{\circ}$ C., but the cycle is of so short a duration that inside a box placed in such a hut the temperature may be regarded as constant. When a portion of the steam was blown into the air of the hut, in order to ensure saturation with moisture, the indications of the controlling thermometer rarely varied as much as 0.2° C. from the point at which the contact was sealed in. This form of regulator is more sensitive than the one described in section I., is cheaper to construct, and the thermometer bulb is the only portion which is inside the hut. The two electro-magnetic regulators ran constantly for many months without requiring much attention beyond the occasional recharging of the accumulators. It is, however, necessary to record that the creosote thermometers did not appear to be quite reliable, and, as time went on, a little gas developed in the tube, thus slightly altering the true values of the graduations. An ordinary mercurial contact thermometer may be employed instead of Sixe's form if the relay is arranged to close the circuit of the large electro-magnet when the thermometer circuit is broken, or if, using an ordinary relay, an iron disc is attached to the upper end of the valve spindle and the electro-magnet fixed immediately over this disc so that the magnet closes the valve instead of opening it.

III. *An Improved Electric Contact Thermometer*.—The ordinary thermometers with adjustable contacts for use with electro-magnetic thermo-regulators, alarm devices, &c., leave much to be desired. Those which are sealed up are usually

troublesome to adjust and somewhat cumbersome, whilst fairly rapid deterioration is a decided drawback to the use of unsealed thermometers in which the mercury is protected by means of creosote. This defect of the latter can, however, be obviated by covering the mercury with purified petroleum instead of with creosote. A thermometer having one platinum wire sealed into the bulb and the other passing down the stem through a binding screw fixed just above the open top has been intermittently used during the past year, in conjunction with a Scheibler gas regulator, for controlling the temperature of a water oven. The surface of the mercury still remains bright and breaks contact sharply, whilst the petroleum ("Liquid Petroleum, B.P.," sp. gr. 0.882) has neither crept over the top nor undergone any apparent change.

It may be remarked that Scheibler's electro-magnetic gas regulator is in many respects an ideal one for accurate work, and should be widely used if placed on the market at a more moderate price than at present.

IV. A Simple Regulator for use with Large Gas Burners (Fig. 3).—Inside an ordinary Bohemian flask of about 16 oz. capacity is placed a tube, W, of not less than 20 mm. bore, having its lower end closed by means of a cork acting as a pad between the tube and the bottom of the flask.

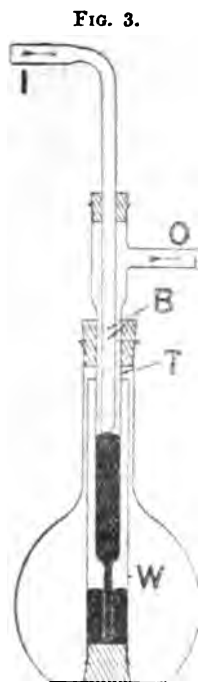


FIG. 3.

After completely filling the flask with methylated spirit, heated to a temperature rather higher than the regulator is likely to attain whilst in use, the neck is closed by means of an india-rubber stopper through which passes a tube, T, the lower portion of which is narrow and reaches nearly to the bottom of W, whilst the upper part is wider and provided with a side branch, O, for connection to the burner or stove. The internal diameter of the middle portion of T should be about 11 mm., i.e., about $2\frac{1}{2}$ to 3 mm. greater* than the external diameter of I (see below). A sufficient quantity† of mercury is next poured into T, the interior dried by means of a filter-paper, and the spirit allowed to cool to the temperature which the regulator is required to maintain. A well-fitting cork, through which passes a tube, I, of about 6 mm. bore, is inserted, and the lower end of I adjusted so as to just touch the surface of the mercury. The tube I serves as the gas inlet and has its lower end ground off obliquely. Two small holes, B, act as bye-passes, permitting the passage of sufficient gas to keep the burner or stove alight if the mercury should at any time entirely cut off the main

stream. It is convenient to have two bye-pass holes of different sizes, say, 0.8 mm. and 1.2 mm. diameter respectively. Either of these can then be wholly or partially blocked with soap, or both can be left open, according to the nature of the work for which the regulator is being used. The regulator is easily made and has a high degree of sensitiveness. If the temperature increases to the extent of 1° C. the expansion of the spirit causes the mercury to rise about 5 mm. in the tube T, a height sufficient to make a very great difference in the amount of gas supplied. The preliminary adjustment is facilitated if a diminutive thermometer is suspended inside the flask in order to indicate the actual temperature of the spirit. The final adjustment for a given temperature is made by raising I about 5 mm. if the temperature is found to have settled down 1° C. below that required, or proportionately in other cases. The dimensions

of the regulator may of course be varied in accordance with the size, &c., of the chamber to be heated and the accuracy required. Those given above are taken from a regulator which has proved very satisfactory in a greenhouse of about 3000 cub. ft. internal capacity and should answer well in a "constant temperature room" of moderate size or in a small drying chamber. Its capacity is about 10 to 20 times that of the ordinary Reichert regulator.

V. A Highly Sensitive Modification of Novy's Gas Regulator.—The ordinary forms of mercurial gas regulator give hopelessly inaccurate results if the gas pressure undergoes marked fluctuations, especially when it becomes great enough to give rise to bubbling after the end of the inlet tube has been covered. It seems a pity that such regulators should be so persistently retained for ordinary laboratory use, as their insensitiveness can be easily remedied by the employment of a larger bulb containing a liquid of high expansibility.

To work out one example in detail: Novy's gas regulator has various advantages over most of the others, but as ordinarily supplied has a bulb holding only about 1.5 c.c. of mercury. The modification shown in Fig. 4 has a

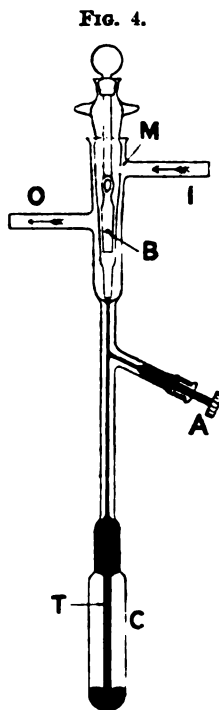


FIG. 4.

cylindrical bulb C* of about 15 to 20 c.c. capacity, provided with an inner tube T reaching nearly to the bottom and continuous with the stem above. The bulb ordinarily contains toluene together with a little mercury, but hydrocarbons or alcohols of higher boiling point may be substituted for the toluene when desired. The bore of the lower part of the stem should be wide enough to hold 2 to 3 c.c. of mercury in order that no gas may be drawn into the bulb when the regulator is allowed to cool. The side branch containing the adjusting screw A should be inclined about 20° to 30° below the horizontal line in order that mercury may be retained in this tube after cooling, otherwise a bubble of gas may be entrapped when the regulator is again heated.

The bye-pass B, the adjustment for maximum supply M, the rigid gas inlet I, and the outlet O, remain unaltered. This modified regulator has proved very satisfactory in laboratory use. The coefficient of expansion of toluene being about five times that of mercury, and the volume of liquid

having been increased about tenfold, it follows that the modification is about 50 times as sensitive to temperature changes as the original form. For certain special purposes it may be necessary to limit the external diameter of the bulb to that of the stem, but, even if the capacity of the bulb is not increased, the regulator is made nearly five times as sensitive by the substitution of toluene for mercury. The working of any regulator of this class is of course improved if a pressure regulator is attached to the supply pipe in order that there may not be a variable tendency for the gas to blow through the mercury.

* The old pattern regulator may readily be altered by cutting off the bulb and sealing on the lower portion of a Tollens gas regulator.

* In order that the annular space between the two tubes may have a rather greater sectional area than the interior of the tube I.

† 10° C. fall of temperature will cause the spirit to contract to the extent of nearly 5 c.c.

Nottingham Section.

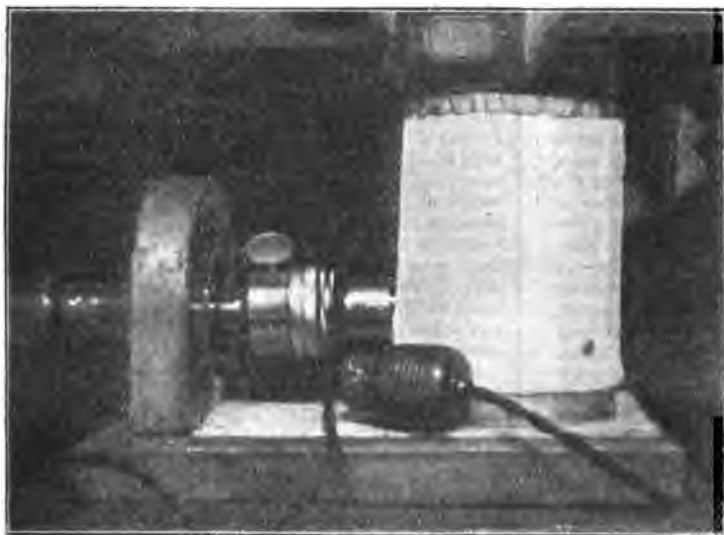
*Meeting held at Nottingham, on Wednesday,
October 26th, 1904.*

MR. J. T. WOOD IN THE CHAIR.

AN ELECTRICAL HEATER FOR LABORATORIES.

BY S. R. TROTMAN AND J. E. HACKFORD.

The apparatus is a simple contrivance consisting of a tin some 6 ins. or 8 ins. deep, and of sufficient diameter to take a lamp of 16, 32, or 50 candle power. The exterior is covered with asbestos paper. The lamp is of the ordinary type, but the greatest heat is obtained from those lamps discoloured by continual usage, and which can be obtained at a trifling cost from dealers in electric light fittings. The lamp is fixed through a hole near the bottom of the tin, as shown in the diagram. The holder, lamp, and tin are placed on a wooden base, the top surface of which is covered with asbestos beneath the tin.



The lamp is useful for saponifications, fat extractions, and the distillation of alcohol and ethers, the source of heat being perfectly constant, not affected by draughts, and it is impossible for inflammable liquids to be ignited.

The apparatus may be conveniently made use of as a method of obtaining the necessary current for the electrolytic arsenic apparatus already described in this Journal (Feb. 29, 1904, pp. 177—179), and also in the Journal of the Chemical Society, 1904, Vol. 85, CV.

The wires are so arranged that when the arsenic apparatus is not in use each lamp may be switched on separately, but when the apparatus is required one main switch will turn on all the lamps, whether the separate switches for the lamps are on or off.

*Meeting held at Leicester, on Wednesday,
November 23rd, 1904.*

MR. J. T. WOOD IN THE CHAIR.

THE MINERAL CONSTITUENTS OF SUMAC.

BY S. R. TROTMAN.

The mineral constituents of sumac have hardly received the attention they deserve, and it appears to be the custom of tanners to raise no objection to excessive ash so long as

the tannin content passes muster. This seems somewhat unwise, since much damage may be done to skins by comparatively small quantities of iron, and the presence of sand in a wheel may also be dangerous from a mechanical point of view. The published information on the subject is somewhat meagre and inconsistent, for while, on the one hand, Andreasch gives 6.6 as the ash content of genuine Italian sumac, Gordon Parker, in a recent paper, places it so low as 2 per cent. Of over 50 commercial sumacs recently analysed, in only 10 cases did the ash fall below 7 per cent., and in two of these 10 below 6 per cent.

In the best methods of sumac manipulation the dried leaf is said to be ground between stone rollers of which all the iron portions are entirely below the level of the sumac. Further, the powder is subjected to a process of ventilation and treatment with powerful electro-magnets to remove iron and magnetic oxide. This is apparently a counsel of excellence only, since 75 per cent. of the sumacs on the market contain very distinct quantities of iron removable by the magnet, in several cases rising to 0.25 per cent. These facts seem to indicate that it is quite time a rigid limit were made, and a firm stand made by those interested in the matter.

My own experiments lead me to the conclusion that the following limits are easily attainable with only moderate ventilation: ash, 6.5 per cent.; silica, 0.75 per cent.; iron, 0.15. These figures were arrived at by taking a large number of sumacs whose ash was from 7.5 per cent. to 9.5 per cent., and subjecting them to a process of winnowing, and then re-determining the ash, silica, and iron. The difference between the ash of the winnowed and unwinnowed sumac is entirely due to the removal of silica, iron, and matter insoluble in hydrochloric acid. The following is a typical example: ash before winnowing, 8.85 per cent.; after winnowing, 6.60 per cent.; silica before winnowing, 2.25; after winnowing, 0.98 per cent. I have numerous other sets of figures reiterating these points. It is to be noted that the difficulties of properly winnowing a small quantity of sumac in a laboratory are considerable, and that much better results could be obtained on the large scale. Hence the standards suggested above

should be very easily obtained in bulk.

The adulteration of sumac leaf with its own stem is fairly common, and in order to see whether the high ashes one frequently finds were due to stem I have, by sifting, obtained sumacs largely composed of stems, and find that the ash is practically never above 7 per cent., however large the proportion of stem may be, thus proving that a large proportion of stems do not necessarily mean a high percentage of ash.

The percentage of combined iron in sumac seems to be very small, not more than 0.1 per cent. The metallic iron as oxide is generally extremely finely divided, and can be almost entirely removed by means of a fine sieve, or, better, by stirring with an electro-magnet. It is quite easy to separate and weigh the magnetic iron by this means, and this method has the advantage that a large quantity of sumac can be used for the test, thus increasing its accuracy. It is a rare thing to find a sample quite free from uncombined iron, and this is a common cause of stains in goods.

DISCUSSION.

The CHAIRMAN quite agreed with the author that a standard of ash for sumac should be fixed upon. The International Association of Leather Trades' Chemists had occupied themselves so far with the determination of tannin in sumac and other materials. The reason of that was not far to seek. Tannin was the most important constituent

for the tanner, and the object of the association was to get chemists to agree in the analysis of that constituent. So they had devoted their attention principally to the estimation of tannin. He thought they might fix a maximum for the ash, iron, &c., in a pure sumac. Sumac was a material which lent itself very easily to adulteration. He could remember the time when manufacturers adulterated it with sand. This, of course, was discovered very easily. Nowadays the manufacturers were much more cunning in their methods. They adulterated it with the leaves of plants which grew wild and were cheap, such as *Tamarix* and *Lentisco*. From his experience of sumac analysis no sumac was free from iron. His firm stipulated that their sumacs should contain no free iron. In testing for this he used a powerful magnet. The chief source of the iron was volcanic sand. He had examined a good many particles under the microscope and they did not appear to be fragments of ordinary metallic iron. He had always believed that the stems contained more ash than the leaves, but Mr. Trotman's figures proved this was not the case.

Mr. HAWTHORN said that if it were a question of the difference in ash being due to a mixture of some other plant it only wanted a cute adulterator to so mix different leaves as to bring the ash to the required amount.

Mr. S. F. BURFORD inquired at what temperature the ash was obtained, since the percentage of ash depended very much upon the temperature of burning.

Mr. S. R. TROTMAN said, in reply, that the sumac was incinerated in the muffle at a low temperature. He had analysed specimens of *Tamarix* and *Lentisco* which had been sent as genuine samples and had found that the ashes were a trifle under 7 per cent. They also contained magnetic iron and possibly were adulterated. The ashes of the adulterants were not sufficiently high to raise the ashes of the sumac. They might take it as a general rule that the ash of any leaf was somewhere between 5.5 and 6 per cent. Giving the maximum at 6.5 per cent. the growers would get every benefit. A good many of the iron determinations had been made before and after stirring with the magnet, and in one or two cases the amount of iron before stirring was 0.5 per cent., and after stirring 0.2 per cent.; whether the iron was metallic or magnetic, it was an adulterant if left in. He had been looking through his records for three years and he found that the ash in sumacs had greatly risen, which would indicate that less trouble was taken in the process of refinement. It would be a good thing if the International Association of Leather Trades' Chemists would take up the matter with a view to standardising the regulations.

Obituary.

THOMAS MESSENGER DROWN, M.D., LL.D.

PRESIDENT OF LEHIGH UNIVERSITY;
PRESIDENT OF THE AMERICAN INSTITUTE OF MINING
ENGINEERS (1897); MEMBER OF THE SOCIETY
OF CHEMICAL INDUSTRY (1888-1904), &c.

Thomas Messenger Drown was born in Philadelphia, Pa., March 19, 1842. Graduating from the Philadelphia High School in 1859, he entered the medical school of the University of Pennsylvania, and received, in 1862, the degree of M.D. For a brief period he practised as a physician, making one or two voyages as medical officer of an ocean steamship. But chemistry, studied incidentally as part of his medical course, had a strong fascination for him, and, following this call, he abandoned his practice as a physician and returned to the position of student, taking special courses in chemistry at Yale and Harvard Universities. After this he spent some years under Bunsen and Kopp at Heidelberg, and in the Royal Mining Academy of Freiberg, Saxony. Returning to the United States thus equipped, he practised for some years in Philadelphia as an analytical chemist, and in 1875 he accepted the professorship of chemistry at Lafayette College, Easton, Pa. In 1885 he assumed and held a similar position in the faculty of the Massachusetts Institute of Technology, Boston. During this period he planned and executed what has been considered his most useful and memorable achievement, viz., the systematic investigation of the spring-waters and well-waters of Massachusetts, and the preparation, on the basis of the analyses made, of the famous "chloride map" of that State, from which at a glance there may be determined how much chlorine found by the analysis of water from a given locality can be considered as due to the saline breezes of the Atlantic, and how much should be regarded as indicative of organic contamination.

Dr. Drown became a member of the American Institute of Mining Engineers at its first meeting in 1871, secretary in 1873, and in 1897 he was elected President. In 1895 he left the Massachusetts Institute of Technology to accept the presidency of Lehigh University, Pa., and in the same year Columbia University, in the city of New York, conferred upon him the honorary degree of doctor of laws. The position of President of the Lehigh University he occupied for the remainder of his days.

Dr. Drown died suddenly on Nov. 17th; and a former colleague and friend writes of him: "Would there were more like him, for us to love, to admire, and to imitate!"

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I.—PLANT, APPARATUS AND MACHINERY.

ENGLISH PATENTS.

Discharging Corrosive Acids and other Liquids from Carboys and other Receptacles by Pneumatic Pressure; Means for —. E. H. and C. G. Boucher, London. Eng. Pat. 22,845, Oct. 22, 1903.

In discharging liquid from a carboy one of two methods may be adopted, both of which methods are claimed. According to the first method, a cap, through which a pipe dipping into the liquid passes, the external portion serving to deliver the liquid in any desired direction, and having an inlet tube for compressed air, is fitted air-tight to the neck of the carboy. The second method consists in placing the carboy inside a vessel, forming a chamber or casing, which can be closed air-tight, through which an air-inlet pipe and a delivery pipe dipping into the liquid in the carboy, passes. In either case, on forcing air through the air pipe, the liquid is forced through and out of the delivery pipe. In combination with the means referred to in the first method, a carboy truck, having a swinging cradle, and to which the apparatus can be attached, is also claimed. The method may also be applied to the raising of a liquid from a well or tank, by immersing the air-tight vessel referred to in the second method, in and below the level of the liquid, alternately filling the vessel or chamber with the liquid through a valved opening and expelling the contents up through a delivery pipe.—W. H. C.

Regulating Temperature; Apparatus for —. E. Paul, Seaforth, Lancs. Eng. Pat. 23,900, Nov. 4, 1903.

A bent and flattened tube, filled with liquid, is placed in contact with the fluid, the temperature of which is to be regulated. One end of the tube is fixed, the other being free to move, and controlled by an adjustable spring. The motion of the free end, under the influence of any variation of temperature is communicated to a valve which controls the supply of steam or other heating medium.—W. H. C.

Gas and Liquid; Apparatus for Bringing — into Intimate Contact. A. Schneller, Ginneken, and D. Koeleman, Noordrinde, Holland. Eng. Pat. 24,379, Nov. 10, 1903.

SEE Fr. Pat. 336,644 of 1903; this J., 1904, 382.—T. F. B.

Incrustation in Steam Boilers; Compound for Preventing —. T. Byrne, G. L. Scott, and W. Wheatley, Kingston-upon-Hull. Eng. Pat. 24,651, Nov. 13, 1903.

THE compound is prepared by boiling 8 cwt. of oak blocks with 500 gallons of water. To the solution obtained, 0.5 cwt. of alkali (common soda) may be added. The compound is mixed with the feed water or introduced into the boiler.—W. P. S.

Evacuating Air; Method and Apparatus for —. A. Pfeiffer, Wetzlar, Germany. Eng. Pat. 2291, Jan. 29, 1904.

WHEN using several pumps, the best vacuum is most quickly reached by working them arranged first in parallel and then in series. A special form of cock or valve is used to effect this change of connection. The plug has a vertical outlet, *l*, Fig. 1, communicating with the external air. In this outlet is a sliding "displacer" with a rod extension pro-

jecting downwards through the bottom of the plug, as shown. Fig. 3 is a cross section along *m m* of Fig. 2; and Fig. 4 a section on the line *n n* of Fig. 3. When the plug of the cock is rotated, the inclined plane, Fig. 4, raises the "displacer," and so allows the sealing liquid to fall, as in Fig. 2. On rotating the plug in the reverse direction, the

FIG. 1.

FIG. 2.

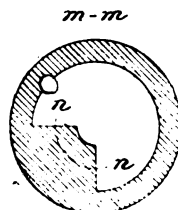
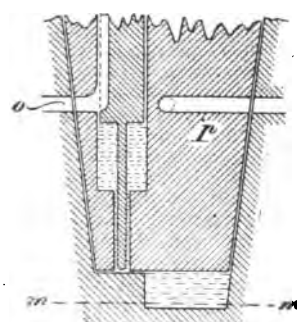
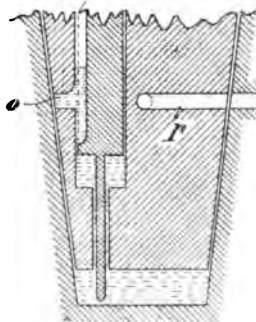


FIG. 3.



FIG. 4.

"displacer" falls, and forces the sealing liquid into the position shown in Fig. 1. Fig. 2 shows the cock in the "parallel" position, the outlet *o* being in connection with the air, and the "displacer" raised. Fig. 1 shows the cock in the "series" position, with the outlet *o* closed, and all access of air through *l* to the surface of the plug prevented by the rise of the sealing liquid.—W. H. C.

UNITED STATES PATENTS.

Drying Apparatus. G. D. Harris, Bayshore, N.Y., Assignor to Condensed Pure Food Co., Cohocton, N.Y. U.S. Pat. 774,321, Nov. 8, 1904.

To prevent overheating, the cells of the drying apparatus are arranged in adjacent vertical rows, separated by air spaces open to the atmosphere, and independent of the conduit for the drying-current of air.—L. F. G.

Kiln. W. N. Weir, South River, N.J. U.S. Pat. 774,544, Nov. 8, 1904.

ROUND a chimney are grouped a number of kilns, each comprising a main chamber with perforated bottom and "flash-wall" for the ware to be burned, and an annular chamber in the wall of the kiln, opening into a space behind the "flash-wall." Beneath the perforated bottom is a

main flue, communicating by means of valved passages, with the chimney and with the annular chamber of the next kiln. The kilns are provided with main fire-boxes discharging into the space behind the "flash-wall," and with a valved "bull-hole" in the top of the kiln, opening into a closed receiver, flues connecting the various receivers.

—L. F. G.

II.—FUEL, GAS, AND LIGHT.

Luminiferous Salts and Illuminating Bodies. H. Bunte. *J. Gasbeleucht.*, 1904, 47, 1011—1013.

THE temperature of the Bunsen flame was found to be considerably higher than that at corresponding places on the Auer mantle, showing that no appreciable increase of temperature is caused by a catalytic action of the rare earths of which the mantle is composed. The similarity in form of the curves showing the distribution of temperature, and of light-emission, indicates also that the intense light of the incandescent Auer mantle is not due to catalytic action. Spectrophotometric experiments showed that as the temperature of the Bunsen flame rises, the light emitted by pure thorium oxide becomes continually bluer; with cerium oxide on a thoria skeleton, the colour of the light remains the same at all temperatures. If gradually increasing amounts of cerium oxide, up to 0.5 per cent., be added to pure thorium oxide, then, at an approximately constant temperature, the colour of the light emitted becomes bluer, whilst the illuminating power increases. With larger additions (up to 1.5 per cent.) of cerium oxide, the number of red rays increases simultaneously with a rise in the illuminating power. If still larger amounts of cerium oxide be added, the colour of the light approaches nearer and nearer that of incandescent, pure cerium oxide, whilst the illuminating power decreases. The mass of the incandescence-body has an influence on the colour of the light; with a mixture of a given composition, the light emitted is bluer, the lower the weight of the mantle. In view of these experiments, the author rejects his former view that the intense light emitted by the Auer mixture is due to catalytic action (his *J.*, 1898, 229; 1901, 791), and concludes that the thorium oxide merely acts as a vehicle for the particles of cerium oxide, which latter are the true light-emitting agents. The cerium oxide is maintained at a high temperature in the flame owing to its distribution and to its being present in only small quantities; its illuminating action is a consequence of selective radiation. (See also this *J.*, 1898, 1129; 1901, 791; 1902, 1012.)—A. S.

ENGLISH PATENTS.

Coking Ovens; Impts. in — C. G. Redfern, London. From Poetter and Co., Dortmund, Germany. Eng. Pat. 17,661, Aug. 13, 1904.

IN these coking ovens a passage runs alongside the gas-distributing passage, and communicates through openings with the vertical heating flues in which are placed the gas nozzles. The openings are closed by plugs, and by removing these latter, access can be had to the nozzles and to the air-regulating dampers.—L. F. G.

Heat from Gases produced from Solid Combustibles; Apparatus for the Recovery of — L. Hertzog, Arbon, Switzerland. Eng. Pat. 22,546, Oct. 19, 1903.

THE furnace is surrounded by a wall of sheet metal or brick-work, and the hot furnace gases are led in a downward direction through the space thus formed. Another wall surrounds the first wall, and a fluid which it is desired to heat, is passed through this second interspace. The fluid may be gas or air, which is then conducted into the furnace.

—L. F. G.

Gas Retort Beds; Inclined — A. J. S. B. Little, Smethwick, Staffs. Eng. Pat. 24,995, Nov. 17, 1903.

IN a bench of inclined retorts, the gas-producers and the regenerative passages are arranged in the space formed by the angle between the retorts and the ground level, the producers and their charging openings being situated beneath the charging ends of the retorts. Between every

pair of retort-beds there is an elevator, working in an inclined tunnel, which delivers the coke from the discharging-ends of the retorts to the charging-openings of the producers. By this arrangement the height of the retort-house, and the amount of constructional work generally, are reduced, only one staging being required for charging both the retorts and the producers.—H. B.

Retort Benches for the Manufacture of Illuminating Gas. E. Derval, Paris. Eng. Pat. 15,860, July 16, 1904. Under Internat. Conv., Sept. 5, 1903.

SEE Fr. Pat. 339,015 of 1903; this *J.*, 1904, 1081.—T. F. B.

Furnaces of Gas Producers [for Gas Retort Settings, &c.] J. F. Bell, Derby, and R. Masters, Bedford. Eng. Pat. 28,342, Dec. 24, 1903.

THE fire-bars of the producer are inclined from the front of the furnace to the back, and are made of angle- or other trough-like section. Water drips into these bars at the front of the furnace, from a series of nozzles on a horizontal water-supply pipe, which is adapted to be swung upwards, clear of the furnace door, during clinkering operations. The water furnishes the steam required by the producer, and keeps the fire-bars cool. An additional set of horizontal, trough-like bars, may be arranged beneath the fire-bars, to increase the generation of steam, the water drip-pipes which supply these lower bars, being attached to, and adapted to be swung up with, the water supply-pipe mentioned above.—H. B.

Gas from Coal or other Material; Apparatus for the Manufacture of Crude [Producer] — H. Heenan, Manchester. Eng. Pat. 23,616, Oct. 31, 1903.

THE producer consists of two superimposed chambers having a contracted passage between them; a trough-like tuyère, partly filled with water, is situated round the passage, from which a hot blast of air and steam is forced up through the fresh fuel fed into the upper chamber; a flue which leads the "green" gases from the top of the upper chamber to another trough-like tuyère, situated beneath the incandescent fuel in the lower chamber; an injector, by means of which air and steam, intermingled with the "green" gases, are forced from the tuyère up through the incandescent fuel; flues round the top of the lower chamber, for leading off the gas; a bridge for supporting the fuel; and a water-sealed ash-pan. The fuel is fed through a hopper into the upper chamber, and descends into the lower chamber as required.—H. B.

Gas [Water-Gas]; Manufacture of Combustible — J. Bowing, Tilbury, Essex. Eng. Pat. 28,498, Dec. 28, 1903.

WATER-GAS is produced, without the intervention of an air-blast period, by the treatment of comminuted fuel with superheated steam in a retort, the retort charge being heated internally by means of the superheated steam only. Steam, at a pressure somewhat above that at which it is desired to be used in the retort, is passed through a superheater, which raises it to about 700° C., and is then led into the retort through a pipe having a perforated portion which is surrounded by the fuel. The steam-blast, in passing through the mass of fuel, is reduced to a quiet flow, and a mixture of carbon monoxide and hydrogen is produced. H. B.

Producer-Gas; Manufacture of —, and *Apparatus therefor.* J. Armstrong, London. Eng. Pat. 544, Jan. 8, 1904.

THE combustion chamber of the producer is divided by means of a vertical partition into two compartments, each provided with air-blast and steam-blast pipes. While the air-blast is being supplied to the fuel in the one compartment, steam is blown simultaneously through that in the other, the gases generated being allowed to mix at the top of the partition on their way to the furnace. The air-blast and steam-blast periods in each compartment alternate in the usual way. Instead of using one divided producer, two separate producers may be worked in connection with one another. Instead of steam, furnace gases rich in carbon

dioxide may be used, with or without the addition of steam, the feed being reversed from time to time from air to furnace gases and *vice versa*.—H. B.

Illuminating Gas; Manufacture and Purification of — [from Naphthalene]. A. Colson, Knighton, Leicester-shire. Eng. Pat. 16,766, July 29, 1904.

COAL-TAR, oil-tar, blast-furnace tar, or the like is distilled, either before or after removal of carbofic acid, naphtha, &c., and the portion which distils below 270° C. is collected and redistilled so as to yield a fraction boiling between 170° and 215° C. This fraction is used as a solvent for the removal of naphthalene from the gas to be purified, the cooled gas, free from tar, being treated preferably in a washer wherein the gas is compelled to travel through the liquid in fine streams.—H. B.

Oil-Gas; Production of — F. G. C. Rincker, Water-graafsmeer, and L. Wolter, Amsterdam, Holland. Eng. Pat. 20,371, Sept. 21, 1904.

FUEL is brought to incandescence in a producer, the air-supply is stopped, and oil is then fed upon the top of the fuel, the gas produced being led off at the foot of the producer to a scrubber, in which it is washed with water.

—H. B.

UNITED STATES PATENTS.

Peat Fuel; Process of Manufacturing — C. F. Schlickeysen, Steglitz, Germany. U.S. Pat. 773,992, Nov. 1, 1904.

SEE Fr. Pat. 327,873 of 1902; this J., 1903, 944.—T. F. B.

Fuel; Manufacture of Artificial — J. J. Shedlock, Little Bentley, England. U.S. Pat. 774,705, Nov. 8, 1904.

SEE Fr. Pat. 340,981 of 1904; this J., 1904, 816.—T. F. B.

Coke-Oven. G. S. Ramsay, St. Marys, Pa. U.S. Pat. 773,809, Nov. 1, 1904.

THE oven is provided with a central, main, bottom flue communicating at one end with the stack; vertical flues at the front and rear, communicating at their upper ends with the interior of the oven; and bottom flues connecting the vertical flues with the main bottom flue. The bottom flues at the rear of the oven are shorter than those at the front, and the flues on one side of the main flue are independent of those on the other side and also of each other, the walls forming and separating them being continuations of the outer wall of the oven and acting as supports for the floor of the oven. These bottom flues each consist of an outer radial portion, a portion in the form of a loop or approximately U-shaped, and a short inner transverse portion.—A. S.

Coke Quenching and Bleaching Apparatus. E. A. Moore, Philadelphia, Pa. U.S. Pat. 774,330, Nov. 8, 1904.

THE claim is for a receptacle for the hot coke, in combination with a trench containing water, means for supplying the water to the coke, and a pipe and jet-condenser for the steam generated during quenching.—L. F. G.

Gas; Apparatus for the Manufacture of — H. A. Bradley, Assignor to the Bradley Universal Heat, Light, and Power Co., New York. U.S. Pat. 773,781, Nov. 1, 1904.

WITHIN the furnace are arranged three casings, forming respectively a generator, a burner for heating the latter, and a second burner for heating the first-named burner. The generator consists of three intercommunicating compartments, *viz.*, a steam chamber, which receives steam from an external boiler, a carburetting chamber into which liquid fuel is fed, and a fixing chamber (communicating with a gas-holder) within which the mixture of steam and fuel is converted into fixed gas. The two burners are similar in construction to the generator, except that the fixed gas produced by them is allowed to issue into the furnace, where it is burned, instead of being led off to the gas-holder.

—H. B.

Gas-manufacturing Apparatus. C. R. Ingham, Suffern, N.Y. U.S. Pat. 774,430, Nov. 8, 1904.

A STEAM-SUPERHEATER, consisting of several connected pipes of small diameter, filled loosely with fragments of cast-iron or the like, is arranged within a furnace which is surrounded by a wall forming a space for the passage of the products of combustion. The steam from the superheater enters a mixer under pressure, and in doing so impinges upon a supply of liquid hydrocarbon, the vapour of which it carries into the mixer. The mixer consists of an elongated chamber, closed at one end, and having at the other an inlet for the steam and hydrocarbon, and an outlet for the gas produced. The gas is led through a fixing retort consisting of a number of connected pipes of small diameter, filled loosely with refractory material, and situated within the combustion chamber of a secondary furnace. The resultant illuminating gas is led off from the fixing retort.—H. B.

Charger for Gas-Producers. E. H. Carroll, Assignor to Morgan Construction Co., Worcester, Mass. U.S. Pat. 774,561, Nov. 8, 1904.

THE charger consists of a stationary top-plate, a fuel reservoir, and a rotating feed-casting interposed between the two, and provided with an opening eccentric to its axis of rotation, through which the fuel drops from the reservoir on to the top-plate, over the outer edge of which it is swept by the movement of the feed-casting. On the top of the latter a water-chamber is provided to keep it cool, and a water-seal is formed at the joint between the feed-casting and the reservoir. An agitator rotates in the eccentric opening, to loosen the fuel.—H. B.

Gas-Scrubber. A. Steinbart, Carlstadt, N.J. U.S. Pat. 774,207, Nov. 8, 1904.

A VERTICAL cylindrical vessel is provided at the top with a concentric, rotary, spraying nozzle, fed with water. The spray falls on a series of concentric rings, the upper edge of each ring rising above the edge of the adjacent inner ring, and the lower edge of each ring being toothed. The rings convert the spray from the nozzle into a vertically falling rain, which, after descending through the stream of gas, is collected and run off at the foot of the scrubber.—H. B.

FRENCH PATENTS.

[Fuel] **Briquettes; Manufacture of —** H. S. Gerdes. Fr. Pat. 344,225, June 23, 1904.

ANTHRACITE or coal, in small pieces, or in the form of powder, is mixed with fresh peat, or similar moist material, to which an alkali may be added, pressed into blocks, and dried.—L. F. G.

Producer Gas; Process and Apparatus for Producing — P. Stiens. Fr. Pat. 344,671, July 8, 1904.

SEE Eng. Pat. 14,971 of 1904; this J., 1904, 977.—T. F. B.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM, AND MINERAL WAXES.

ENGLISH PATENT.

Petroleum and other like Hydrocarbons; Process for Saponifying — F. J. Lothammer, Paris, and C. Trocquet, Colombes, France. Eng. Pat. 26,366, Dec. 2, 1903.

SEE Fr. Pat. 338,636 of 1903 and addition thereto; this J., 1904, 655.—T. F. B.

UNITED STATES PATENTS.

Wood; Process of Deriving Products from — C. M. Dobson, New York, Assignor to The Wood Distillates and Fibre Co., Chicago. U.S. Pat. 774,135, Nov. 1, 1904.

WOOD is heated by steam and external heat to a temperature sufficient to liquefy the gums and resinous matter, but not

for a sufficiently long time to carbonise the fibrous portion; the heated mass is crushed by heated "mechanical means," and then macerated and heated simultaneously; the liquid portion is finally removed from the fibrous mass by pressure. —T. F. B.

Wood Distilling and Preserving Apparatus. F. S. Davis, Shirley, Assignor to J. C. Richardson, Robertsville, S.C. U.S. Pat. 774,649, Nov. 8, 1904.

EACH member of a battery of horizontal cylindrical retorts is connected with a tank in which the "distilling and preserving fluid" is heated. The connections consist of a valved pipe for introducing the fluid into the retort, and another for discharging the fluid from the retort into the tank, a pump being so situated that a continuous circulation of the liquid between the tank and any one of the retorts may be maintained; thermometers are fixed in the inlet and outlet pipes near each retort. Valved vapour-outlet pipes are provided in the top of each retort, leading to a single condenser. —T. F. B.

IV.—COLOURING MATTERS AND DYE STUFFS.

1.5-Diaminoanthraquinone; Bromination of. R. Scholl and H. Berblinger. Ber., 1904, 37, 4180—4184.

2.6-Dibromo-1.5-diaminoanthraquinone is obtained both by the gradual addition of bromine to 1.5-diaminoanthraquinone suspended in cold glacial acetic acid and by direct bromination. The product is digested in bisulphite solution, washed, dried, and recrystallised from hot nitrobenzene. It forms blue, lustrous needles melting at 274° C. Experiments made to establish its orientation have shown both bromine atoms to be in ortho-position to the amino groups. **2.4.6.8-Tetrabromo-1.5-diaminoanthraquinone** is prepared by brominating 1.5-diaminoanthraquinone in boiling glacial acetic acid or its disulphonic acid in water. It may also be obtained by direct bromination, as in the case of the dibromo derivative, allowing the resulting tetrabromide, however, to digest in water in the place of bisulphite solution. It crystallises in green lustrous needles, sparingly soluble in hot nitrobenzene, but insoluble in the usual solvents.

—D. B.

Anthraquinone; Diazonium Compounds of. F. Kačer and R. Scholl. Ber., 1904, 37, 4185—4187.

Acid anthraquinone-1-diazonium sulphate was prepared from 1-aminoanthraquinone by diazotisation in presence of sulphuric acid. It forms a light yellow, crystalline powder, which is stable at the ordinary temperature, but decomposes on heating. When its sulphuric acid solution is heated gently with alcohol, anthraquinone is regenerated. **Acid anthraquinone-1.5-bisdiazonium sulphate** was obtained by diazotising 1.5-diaminoanthraquinone in presence of sulphuric acid. It is an orange-coloured crystalline salt, which is sparingly soluble in water and stable at the ordinary temperature, but decomposes at 172° C. Diazonium compounds prepared from 1.3- and 1.8-diaminoanthraquinones are readily soluble in water—a fact which may be utilised for obtaining from crude diaminoanthraquinone the azo dyestuffs of the 1.5-derivative in a pure form. —D. B.

Stilbene Group; The Colouring Matters of the. I. A. G. Green. Chem. Soc. Trans., 1904, 85, 1424—1431.

Two formulæ have been assigned to the stilbene dyestuffs, viz., that of azoxystilbene derivatives by Bender and Schultz (Ber., 1886, 3234), and that of dinitrostilbene derivatives by O. Fischer and Hepp (see this J., 1894, 29, and Ber., 1895, 2281). In addition to the fact that it is improbable that substances so constituted should possess dyeing properties, the following considerations show that the suggested formulæ do not correctly indicate their constitution:—Curcumine (Direct Yellow) does not give dinitrostilbenedisulphonic acid on oxidation with chromic acid (as Fischer and Hepp stated), but produces a greenish-yellow dyestuff

apparently identical with Mikado Golden Yellow. In Eng. Pat. 12,922 of 1896 (this J., 1897, 531) it is shown that by condensing *p*-nitrotoluene-*o*-sulphonic acid with dehydrothioluidinesulphonic acid, a more soluble, yellowish dyestuff is produced, containing aldehyde groups (Curcuphenine), which is shown to be an imine of stilbene aldehyde, in the formation of which 4 mols. of *p*-nitrotoluene took part. It was further proved that all stilbene dyestuffs contain a certain amount of aldehydic products (see Eng. Pat. 6760 of 1898; this J., 1899, 362), and that all stilbene derivatives on alkaline oxidation give rise to aldehydes (Eng. Pats. 21,825 of 1897, and 1431 and 4045 of 1898; this J., 1898, 915, and 1899, 133). By oxidising *p*-nitrotoluene-*o*-sulphonic acid with sodium hypochlorite, it was found possible to produce, according to the conditions, dinitrostilbenedisulphonic acid or dinitrodibenzylidinesulphonic acid (Eng. Pat. 5357 of 1897; this J., 1898, 148). On heating the former with sodium hydroxide and a small quantity of some oxidisable substance, and the latter with sodium hydroxide alone, a yellow dyestuff was obtained which contained no aldehydic or alkali-sensitive product (see Eng. Pats. 21,399 and 21,553 of 1897; this J., 1898, 915). On reduction, this gives rise to a series of yellow dyestuffs, and finally to diaminostilbenedisulphonic acid. In addition to these dyestuffs, the two dinitro acids form condensation products with primary amines, which appear to be mixed azo or azoxy dyestuffs, indicating a complex structure for stilbene dyestuffs. *p*-Nitrotoluene and its *o*-substituted derivatives, on treatment with alkali hydroxide, all give highly coloured unstable intermediate compounds, which, on further heating, are transformed into analogues of Curcumine, the readiness with which these intermediate compounds are formed being found to depend on the nature of the *o*-substituent group. Dinitrostilbenedisulphonic acid is not formed by direct oxidation of the *p*-nitrotoluenesulphonic acid, but is formed from the intermediate compounds mentioned above. Dinitrostilbenedisulphonic acid is also readily converted by alkaline reduction into this intermediate compound; hence it is probable that these two compounds are very similar in constitution, and that their formulæ only differ by two atoms of oxygen. Some doubt, however, existed from the fact that it was never found possible to obtain a higher yield than 65 per cent. of the dinitrostilbenedisulphonic acid. (See next abstract.) —T. F. B.

Stilbene Group; The Colouring Matters of the. II. A. G. Green, F. Marsden, and F. Scholefield. Chem. Soc. Trans., 1904, 85, 1432—1438.

On heating phenyl-*p*-nitrotoluene-*o*-sulphonate with alkali hydroxide, an unstable blue compound was produced, which, on oxidation, gave what proved to be a mixture of phenyl-*cis*- and *trans*-dinitrostilbenedisulphonates in almost theoretical yield. This mixture was separated into its components, which are described. The corresponding *cis*- and *trans*-dichlorodinitrostilbenes were similarly produced in good yield from *o*-chloro-*p*-nitrotoluene. All these dinitrostilbene derivatives are readily reconverted into the highly coloured intermediate compounds on reduction. The fact that the above compounds are obtained in almost theoretical yield removes the doubt mentioned in the preceding abstract, whence there appears every reason to regard these intermediate compounds as nitrostilbene or stilbene nitrolic acid derivatives, and since they are only coloured in alkaline solution, they would have a quinonoid structure, e.g., the crimson compound from *p*-nitrotoluene-*o*-sulphonic acid would have the constitution—



Further, the above work shows that Green and Wahl's dinitrostilbenedisulphonic acid (this J., 1898, 146) is really a mixture of the *cis*- and *trans*-isomerides, and it is also probable that, since it is formed by oxidation of the crimson intermediate product obtained in the preparation of Curcumine, this intermediate product and the stilbene dyestuffs to which it gives rise are all mixtures of the two isomerides. —T. F. B.

Paranitraniline Red; Copper Compound of —. W. Schaposchnikoff and V. Svientoslavski. *Z. Farben- u. Textil-Ind.*, 1904, 3, 422—426.

By boiling a mixture of Paranitraniline Red and copper sulphate together with ammonia in water for six hours, a deep brown product was obtained, containing 9 per cent. of copper oxide. A copper naphtholate solution was prepared according to Goldovsky's method and added to the diazo solution of paranitraniline; a compound separated out containing 3 per cent. of copper oxide. After boiling the mother-liquors for 20 hours, the precipitate contained 11 per cent. of copper oxide. When boiled with 10 per cent. hydrochloric acid it contained only 7 per cent. of copper oxide; but on extracting the unchanged oxyazo dyestuff with boiling toluol, the residue contained 11—12 per cent. of copper oxide. The formula of the copper compound is probably $\text{Cu}(\text{O.C}_{10}\text{H}_6\text{.N:N.C}_6\text{H}_4\text{.NO}_2)_2$, which requires 12.2 per cent. of copper oxide. Goldovsky's method is not suited for practical purposes, as only 3—3½ per cent. of copper oxide is taken up instead of 12.2 per cent. The best method is that of Müller, in which the ready-dyed material is passed three times through a boiling copper sulphate solution (1:1000). The brown is completely developed in two hours. The addition of a little acetic acid helps the process.—A. B. S.

Dyestuffs; Action of Low Temperatures on —. J. Schmidlin. *Comptes rend.*, 1904, 139, 731—732.

DYESTUFFS were exposed to the temperature of liquid air. In no case, when the dye was fixed on a textile fabric, was there any effect produced. In alcoholic solution, some dyestuffs, such as Methylene Blue and Malachite Green, were unaffected; but the rosanilines all exhibited a considerable diminution in the intensity of their colours, and there appeared a yellowish green fluorescence, the solution acquiring an appearance resembling that of Eosin. Possibly this fluorescence exists at ordinary temperatures, but is not noticeable on account of the intensity of the red or violet colour. Alcoholic solutions of Eosin cooled in liquid air also exhibit a diminution in the intensity of the colour viewed by transmitted light, whilst the fluorescence remains unchanged.—J. T. D.

ENGLISH PATENTS.

Sulphur Colouring Matters [Sulphide Dyestuffs] and Intermediate Products therefor; Manufacture of —. J. Y. Johnson, London. From Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine. Eng. Pat. 24,930, Nov. 16, 1903.

By oxidising a mixture of equimolecular proportions of a phenol and *o-o*-dichloro-*p*-phenylenediamine [2.6.1.4], large quantities of stable indophenols are produced, which are readily reduced to the corresponding diphenylamine derivatives. By melting these new indophenols or diphenylamine derivatives with sulphur and sodium sulphide, dyestuffs of great colouring power are obtained. These dye cotton from sodium sulphide solutions greenish-grey to bluish-grey shades, which are rapidly converted to deep violet on exposure to air.—T. F. B.

Dyestuffs Derived from Anthracene [Anthracene Dyestuffs]; Manufacture of —. O. Imray, London. From Farbwerke vorm. Meister, Lucius und Brüning, Höchst on the Maine. Eng. Pat. 26,182, Nov. 30, 1903.

ACCORDING to Eng. Pat. 7387 of 1902 (see this J., 1903, 293), dyestuffs are obtained by condensing hydroxyanthraquinones with sulphonic acid salts of primary aromatic amines under pressure and at high temperatures. It is now found that hydroxy- or aminoanthraquinones can be condensed with the salts of sulphonic or carboxylic acids of primary aromatic amines, in presence of reducing agents (e.g., stannous chloride), under normal pressures and at moderately low temperatures (100°—140° C.). Suitable anthraquinone derivatives are those in which the 1- and 4-positions are occupied by amino- or hydroxy- (or alkyl oxy) groups, and the 5-, 6-, 7-, and 8-positions by hydrogen atoms or by hydroxy or amino groups. The resulting dyestuffs dye unmordanted wool in greenish-blue, blue, and

bluish-violet shades. The dyestuffs obtained according to Eng. Pat. 23,927 of 1894 (see this J., 1895, 1041) by sulphoning the condensation products of hydroxyanthraquinones with primary aromatic amines are disclaimed. (See also U.S. Pat. 754,768 of 1904; this J., 1904, 368.)

—T. F. B.

FRENCH PATENTS.

Anthracene Series; Production of Dyestuffs of the —. [Anthracene Dyestuffs.] Badische Anilin und Soda Fabrik. Addition, dated Sept. 17, 1903, to Fr. Pat. 339,044, March 30, 1903.

SEE Eng. Pat. 20,151 of 1903; this J., 1904, 319.—T. F. B.

Dyestuffs Derived from Acridine Yellow; Process for Making Orange-Red —. [Acridine Dyestuffs.] Farbwerke vorm. Meister, Lucius und Brüning. Fr. Pat. 339,051, Sept. 19, 1903.

SEE U.S. Pat. 766,540 of 1904; this J., 1904, 932.—T. F. B.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

Aluminium; New Use for —. *Elect. Review*, 1904, 45, 70.

THE U.S. Consul at Frankfort, Germany, states that in spinning machines, aluminium is being substituted for wood, especially for the spools or bobbins. The aluminium bobbins are only two-fifths as heavy as the wooden ones, and are more durable, being less sensitive to alteration of temperature and to moisture.—A. S.

Cotton; Wetting of — by Water and by Water Vapour. O. Masson. *Proc. Roy. Soc.*, 1904, 74, 280—254.

WHEN dried cotton-wool is immersed in water, its temperature rises for some time, and afterwards slowly falls. The same phenomenon occurs when the cotton-wool is exposed to air saturated with aqueous vapour; and in both cases the courses of the curve representing the rise and fall are similar, and are similarly affected by previous moisture and other conditions. In the latter case the effect is due to the condensation on the cotton of vapour which it absorbs, for both absorption and heat-production occur for many hours, and the amount of heat is approximately that calculated from the quantity of vapour absorbed. In the former case, though absorption cannot be directly observed, it must occur, and the air adhering to the fibre maintains the separation necessary for distillation to occur. Medical or "absorbent" cotton-wool, though it behaves like ordinary cotton-wool in saturated air, does not show the same rise of temperature in water. The water condensed on the cotton certainly does not combine chemically with it; and it is not simply condensed as a film on the surface, for the quantity is too great for the recognised maximum thickness of such films. It probably undergoes osmotic diffusion into the fibre and forms a sort of solid solution of cellulose and water, having a vapour pressure always lower than that of water. Cotton in air saturated with alcohol vapour, or gun-cotton or glass wool in air saturated with water-vapour, showed similar behaviour, though to a slighter extent, and no effect was produced when cotton was immersed in absolute alcohol or glass wool in water, so that the air-insulation is necessary to produce the effect. This thermal effect is much greater than, and probably quite different from that investigated by Parks, occurring when finely divided solids are mixed with water; but the effects long ago observed by Pouillet when finely divided solids were placed in water were probably in part at least, due to distillation.—J. T. D.

Dyeing [Mordanting] Processes. VII. Form in which Primary Metallic Mordants are Present in Mordanted Fibres. P. Heermann. *Färber-Zeit.*, 1904, 15, 325—327 and 345—347.

Raw and boiled-off silks which had been mordanted with stannic chloride, basic ferric sulphate, chromic chloride,

and aluminium acetate were examined with a view to ascertaining in what form the mordant was present in the fibre. The silk was mordanted by the method previously described (this J., 1903, 623, and 1904, 57), thoroughly washed with water, and titrated directly with standardised sodium hydroxide solution; this method gives a direct determination of the amount of acid radical present in the mordanted fibre in the form of basic salt; its accuracy was checked by fusing the fibre with alkali hydroxide, and determining the amount of acid radical in the usual manner. A deduction was necessary from these results, since traces of acid remain adhering mechanically to the fibre, even after most careful washing, and this was ascertained by substituting for the mordanting a treatment with a solution of the acid of which the radical was present in the mordant, the other conditions of the process, and the analytical method, being the same as above. It was found that considerable range in the concentration of the acid solution used had no effect on the amount of acid adhering to the fibre; e.g., treatment with 1, 5, and 10 per cent. solutions of hydrochloric acid resulted in the same percentage of acid being retained in each case. The analytical data were completed by a determination of the amounts of metallic oxide present in the fibre. The results were as follows: in the case of the tin mordant, the raw silk was found to contain 155 mols. of stannic oxide to each atom of chlorine, corresponding to a formula of $\text{SnCl}_4 + 619\text{Sn}(\text{OH})_4$, and a "basicity number" (see this J., 1904, 438) 0.0019; boiled-off silk contained 143 molecules of stannic oxide to each atom of chlorine, corresponding to $\text{SnCl}_4 + 571\text{Sn}(\text{OH})_4$, and basicity number 0.0021. With the iron mordant on raw silk, 111 mols. of ferric oxide were present to each mol. of SO_3 , i.e., $\text{Fe}_{222}\text{SO}_3(\text{OH})_{664}$, basicity number 0.008; on boiled-off silk, 91 mols. Fe_2O_3 to 1 mol. of SO_3 , or $\text{Fe}_{182}\text{SO}_3(\text{OH})_{544}$, basicity number 0.0096. Chromium mordant on raw silk, 40 mols. of chromic oxide to 1 atom of chlorine, or $\text{Cr}_{80}\text{Cl}(\text{OH})_{240}$, basicity number, 0.009; on boiled-off silk, 44 mols. of Cr_2O_3 to each atom of chlorine, or $\text{Cr}_{88}\text{Cl}(\text{OH})_{264}$, basicity number, 0.008. Aluminium mordant; in neither raw nor boiled-off silk could any acid radical be detected, showing that the aluminium was present as hydroxide. It would thus appear that, for all practical purposes, the mordant is not present in the fibre in the state of a basic salt, but in the form of the hydroxide.—T. F. H.

Coal-Tar Dyestuffs; Behaviour of — towards Starch, Silicic Acid, and Silicates. W. Suida. Monatsh. Chem., 1904, 25, 1107—1143.

Pure potato starch, free from albumin, was shaken up in the cold with solutions of various dyestuffs. After about 15 minutes the liquid was poured off and the starch washed repeatedly by decantation with cold distilled water until the water was not coloured. It was found that basic dyestuffs dye the starch strongly, whereas acid dyestuffs do not. Basic dyestuffs, which have been sulphonated, dye less strongly than the unsulphonated dyestuffs, and if highly sulphonated show little affinity for the starch. Diamine Blue B B forms an exceptional case as in distinction to all other bezidineazo dyestuffs which were tried, it dyes starch strongly. In all cases the dyed starch granules, when examined under the microscope, were found to be uniformly dyed right through. Though water does not remove the dyestuff it is removed slowly by alcohol, more quickly by dilute hydrochloric acid and by acetone. By using sufficient starch, solutions of basic dyestuffs can be completely decolorised. Starch dyed with Magenta did not lose one-third of the intensity of coloration on being extracted with alcohol in a Soxhlet apparatus for several days. The amount of dyestuff taken up by starch is very small. Thus 100 parts of potato-starch can only take up 0.00228 grm. of Magenta, or rather remove the base from the same, for all the hydrochloric acid of the Magenta is left in the bath, which, however, remains neutral, the free acid being neutralised by the mineral matter in the starch. Thus potato-starch behaves towards basic dyestuffs in an analogous manner to animal fibres and hydro- and oxy-cellulose and not like ordinary cellulose. It is not dyed by direct cotton dyestuffs, in which respect it differs from both animal fibres and cellulose. Dyestuffs derived from

diaminostilbene form an exception in this case. Indulin is not dyed by basic dyestuffs. Attempts were then made to dye the following materials with basic dyestuffs, free from ash:—Flowers of sulphur, calcium, strontium, and barium sulphates, calcium, barium, magnesium, manganese, and lead carbonates, aluminium oxide (partly hydrated), aluminium phosphate, kaolin, talc, pumice powder, zinc oxide, and kieselguhr. Only the kaolin, talc, pumice, and kieselguhr were dyed. The other materials took up no colour whatever, and the same results were obtained on using boiling solutions of the dyestuffs. Only the silicates were dyed, and these were dyed very strongly. Acid dyestuffs were tried, but did not dye the silicates, with the exception of some diamine colours which dyed them slightly. A large variety of pure minerals containing silicic acid were then tried, and it was found that only those silicates containing acid hydroxyl groups were strongly dyed by basic dyestuffs (Methylene Blue and Diamine Fuchsine), silicates which were neutral or basic, or which merely contained water of crystallisation not being dyed at all, or only very slightly. Hydrated forms of silicic acid, such as opal and hyalite, were also dyed, but not quartz or flint. A dark augite, jadeite, and petalite formed apparent exceptions to the rule, being dyed, although they contain no free hydroxyl groups, but these minerals readily undergo change, accompanied by hydration. All the minerals which can be dyed in this way lose the property on ignition. When they are dyed, the acid radical of the dyestuff is left in the bath, but combined with basic constituents of the original mineral so that the bath remains neutral. The dyestuff can be extracted from the dyed mineral by hydrochloric acid, alcohol or acetone, but by no means quickly or completely. Both potato-starch and kaolin can be shown to possess weakly acid properties by shaking them with weakly ammoniacal phenolphthalein or cuprammonium solution, which they decolorise. Hydrocellulose also shows this reaction, whereas calcium carbonate, strontium sulphate, zinc oxide, natrolith, and vesuvian do not. Kaolin and other acid silicates can also be dyed by means of an aqueous solution of the carbinol-base of Magenta in an analogous manner to wool, but in the former case warming is necessary, and only little free ammonia must be present. Only 20 per cent. of the dyestuff could be extracted by alcohol from kaolin dyed with Magenta. From dyed wool only 10 per cent. of the dyestuff could be extracted in the same manner. Thus in both cases by far the larger part of the colour remained fixed in the material. Further experiments with kaolin showed that so long as excess of dyestuff was present in the vat, neither temperature, or concentration had any appreciable effect on the strength of the dyeing, also that the dyestuffs used (Magenta, Paramagenta, Methylene Blue and Crystal Violet) were absorbed in molecular proportions, within the limits of experimental error. Kaolin which had been treated with warm caustic soda and then thoroughly washed, acquired by this treatment the property of taking up twice the quantity of basic dyestuff, and also of absorbing acid dyestuffs from an acid bath. Treatment with hydrochloric acid was not found to alter the behaviour of kaolin towards dyestuffs. After treatment with hydrofluoric acid it is not dyed so strongly by basic dyestuffs, but absorbs acid dyestuffs vigorously from an acid bath. During the investigation the inaccuracy and unreliability of colorimetric methods of determining the strength of dyestuff-solutions were repeatedly proved. The effect of varying amounts of hydrochloric acid in the dyeing of wool with Magenta was also tried. Up to 5 molecular proportions of hydrochloric acid per molecular proportion of Magenta caused no diminution in the intensity of the dyeings, but 9 molecules of the acid already produced considerable diminution in the intensity of the dyeing, whilst 65 molecules reduced the intensity by 50 per cent.—E. F.

Zinc Oxide Reserves under Prud'homme's Black.

E. Lauber. Z. Farben- u. Textil-Ind., 1904, 3, 417—419.

The zinc oxide is ground up with its own weight of glycerin.

Standard White.—6 kilos. of zinc oxide paste (1:1) are well mixed with 6 kilos. of glycerin and 4 kilos. of gum tragacanth (75:1000), and passed through a fine sieve.

White Resist.—250 grms. of calcined sodium carbonate are dissolved in 1 litre of water, and well mixed with 5 kilos. of standard white.

Coloured Resists.—The dyestuffs are dissolved in glycerin on the water-bath, mixed with zinc oxide and the necessary thickening agents, and passed repeatedly through the wet colour mill, and then, before printing, through a fine silk sieve. The following is an example:—"Green Lake": 300 grms. of Brilliant Green are dissolved in 250 c.c. of water and 1750 grms. of glycerin, and 6000 grms. of zinc oxide paste (1:1) are stirred in.

Green Printing Colour.—830 grms. of Green Lake are well mixed with 200 grms. of glycerin, 200 grms. of tragacanth (50:1000), and 800 grms. of blood albumin (750:1000); passed through the mill; and sieved.

As these printing pastes have a great tendency to stick in the engraving of the printing rollers, revolving brushes are fitted to remove the residual colour from the rollers. The resists are printed on the white cloth, and the latter is then passed into a hot chamber to coagulate the albumin in order to prevent the running of the colour in the subsequent padding. If the cloth is dried at a low temperature, it is passed for a few minutes through the Mather Platt. The padding with aniline liquor is best done in a two-roller padding machine, the lower roller alone dipping into the padding bath. The printed cloth is passed between the rollers with its printed side downwards, and in order to get a thorough impregnation, is pressed against the lower roller by a smaller roller which is fixed a short distance from the gripping place. The after-treatment of the material in the hot flue and chrome-bath is the same as usual.—A. B. S.

ENGLISH PATENTS.

Multiple-Ply Woven Fabrics; Apparatus for Treating — with Adhesive Compound. W. R. Smith, Buffalo, U.S.A. Eng. Pat. 13,471, June 14, 1904.

MULTIPLE-PLY woven fabrics are first heated and stretched by a passage between a series of heated rollers, each pair of which, after the first, has a greater velocity than the preceding pair. The fabrics are then passed between a pair of heated rollers, by means of which they are treated with a "filling composition," the object of the process being to produce machine belting.—E. B.

Bleaching Textile Materials; Process for —. O. Venter, Chemnitz, Germany. Eng. Pat. 15,395, July 9, 1904.

In order to obtain more even bleaching, the fabric is exposed to the action of the bleaching liquid *in vacuo*, in a completely spread out condition, without longitudinal folds, e.g., hung loosely over a number of rollers fixed at a short distance from one another. Ozonised air or liquid air can be used when necessary to facilitate the bleaching.—T. F. B.

Discharge of Halogenated Indigo Colouring Matters. J. Y. Johnson, London. From Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, Germany. Eng. Pat. 1867, Jan. 25, 1904.

SEE U.S. Pat. 760,817 of 1904; this J., 1904, 659.—T. F. B.

Drying or Carbonising of Fibrous or other Material; Machinery for —. J. Fielden, Rochdale, Lancs. Eng. Pat. 23,607, Oct. 31, 1903.

THIS machine consists of a drying chamber furnished with moving carriers for the material, and heated by a hot-air blast. The material is fed into the tube of the hot-air supply by means of a light roller, which is arranged in guides, so as to rise and fall according to the thickness of the material which is fed into the machine. In its lowest position this roller entirely shuts the feeding inlet and so prevents the entry of cold air, and it only rises sufficiently for the material to pass. A pair of squeezing rollers can also be fitted so as to close the inlet, the material passing between them being thrown into the air pipe by a stripper working inside the machine. The conveyers consist of horizontal trays, which are moved to and fro by connecting rods working with eccentrics.—A. B. S.

UNITED STATES PATENTS.

Dyeing, &c.; Apparatus for —. O. Venter, Chemnitz, Germany. U.S. Pat. 774,407, Nov. 8, 1904.

SEE Eng. Pat. 15,395 of 1904, preceding these.—T. F. B.

Dry-Cleaning Garments; Process of —. L. E. Barbe, Paris. U.S. Pat. 774,025, Nov. 1, 1904.

SEE Addition, of Nov. 5, 1902, to Fr. Pat. 321,542 of 1902; this J., 1903, 794.—T. F. B.

FRENCH PATENTS.

Straw Plait; Process for Producing Two-coloured Effects on — by Means of Sulphide Dyestuffs. L. Cassella et Cie. Fr. Pat. 339,039, Sept. 12, 1903.

SEE Eng. Pat. 20,324 of 1903; this J., 1904, 932.—T. F. B.

Dyeing Yarn; Vat for —, with Device for Putting in and out of Gear a Windlass which Removes the Material to be Dyed from the Vat. E. I. Heuser. Fr. Pat. 345,030, May 3, 1904.

SEE Eng. Pat. 2062 of 1904; this J., 1904, 982.—T. F. B.

Cooling Metallic Dye Vessels; Apparatus for —. C. Bath. Fr. Pat. 344,294, June 27, 1904.

A PERFORATED pipe is fixed near the top of a metallic dye vessel, from which cold water is sprayed upon the outside of the vessel, for the purpose of rapidly cooling the dye-bath contained in this, after it has been heated in the course of use.—E. B.

Printing Warp Yarns; Process and Apparatus for —. A. Hofmann. Fr. Pat. 344,740, July 9, 1904. Under Internat. Conv., July 10, 1903.

SEE Eng. Pat. 24,387 of 1903; this J., 1904, 59.—T. F. B.

Sizing Yarns [on Bobbins]. F. Möller-Holtkamp. Fr. Pat. 344,471, June 30, 1904.

YARNS are wound upon bobbins, and are sized thereon by means of a composition of thinner consistency than usual, which is forced into them by centrifugal action.—E. B.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

FRENCH PATENT.

Printing Paper Intermittently; Apparatus for —. J. Grantil. Fr. Pat. 344,380, June 15, 1904.

THE pattern—e.g., a multi-coloured one—to be reproduced, is engraved upon the requisite number of printing rollers, of the same circumference and geared together as usual, which are arranged round the cylinder of a printing machine at such a distance from this that they come into contact with a raised portion extending around it to a length equal to the circumference of the rollers. As the paper to be printed passes through the machine, those parts of it which lie upon the raised portion of the cylinder during each revolution of this, become printed, whilst a length, corresponding with that of the unraised portion of the cylinder, remains unprinted between every two successively printed lengths.—E. B.

VII.—ACIDS, ALKALIS, AND SALTS.

Perborates; Action of Boric Acid on Alkaline Peroxides. G. F. Jaubert. Comptes rend., 1904, 139, 796–798.

WHEN 248 grms. of boric acid are mixed with 78 grms. of sodium peroxide and added gradually to 2 litres of cold water, the mixture dissolves at first, but later, a crystalline substance separates out, which may be filtered off and dried at a moderate temperature. This substance, when titrated with permanganate solution shows 4.17 per cent. of active oxygen, corresponding with the formula $\text{Na}_2\text{B}_2\text{O}_5 + 10\text{H}_2\text{O}$; the author terms it "perborax." It dissolves in water to the extent of 42 grms. per litre at 11° C. Its aqueous

Oxygen; Withdrawal of — by Platinum. E. Goldstein.
Ber. 1904, 37, 4147—4148.

WÖHLER's experiments (this J., 1903, 1246) on the oxidation of platinum, required for the most part many days or even weeks. The author has been able to show the same reaction is a much shorter time. The absorption of oxygen in vacuum tubes containing it, and the deposition of a film on the glass (no doubt platinum oxide, because different in appearance from the platinum film similarly deposited in a hydrogen tube) was long ago observed, but usually proceeds very slowly. This absorption, however, goes on very rapidly if the platinum cathode be heated almost to whiteness, either by the discharge alone, or by the discharge aided by a current from accumulators. In two or three minutes all the oxygen in a 50—100 c.c. tube thus disappears; the tube soon shows Röntgen effects, and shortly all discharge ceases. In an air tube a minute is sufficient to remove all the oxygen, and leave a residue giving the spectrum of pure nitrogen. This method can be used to remove traces of oxygen from a gas. Whether the wire oxidises and the particles of oxide are then cast off, or whether metallic particles are cast off and these fine particles are oxidised, is not yet decided. This oxidation connects itself with the author's former observation that during discharge the oxygen in vacuum tubes is converted into ozone.—J. T. D.

Sulphates; Volumetric Determination of Soluble —.
M. Monbaupt. XXIII., page 1161.

Sulphates and Chlorides; Use of the Chromates of Barium and of Silver in the Determination of —. L. W. Andrews. XXIII., page 1162.

Perchlorate; Reduction [Determination] of — in the Wet Way. B. Sjölema. XXIII., page 1162.

Strontium; Microchemical Detection of —, and Strontium Chromate. W. Autenrieth. XXIII., page 1161.

Acetates, Cyanides, and Lithium; Methods for the Detection of —. S. R. Benedict. XXIII., page 1161.

Carbon Dioxide; Decomposition of — by Light.
A. Bach. XXIV., page 1164.

ENGLISH PATENTS.

Discharging Corrosive Acids and other Liquids from Carboys and other Receptacles, by Pneumatic Pressure; Means for —. E. H. and C. G. Boucher. Eng. Pat. 22,845, Oct. 22, 1903. 1., page 1139.

Metallic Oxides; Process for the Preparation of — by Direct Combustion of the Metal, and Apparatus therefor. L. Fink-Huguenot, Paris. Eng. Pat. 20,797, Sept. 27, 1904. Under Internat. Conv., April 19, 1904.

SEE Fr. Pat. 342,432 of 1904; this J., 1904, 936.—T. F. B.

Barium Manganate; Manufacture of a —. A. Tixier, R. Cambier, and C. E. Adnet, Paris. Eng. Pat. 28,585, Dec. 29, 1903.

SEE Fr. Pat. 337,629 of 1903; this J., 1904, 489.—T. F. B.

Air and Gaseous Mixtures; Method of Separating — into their Elements, and Apparatus therefor. Soc. l'Air Liquide (Soc. Anon. pour l'Etude et l'Exploitation des Procédés G. Claude) and R. J. Levy, Paris. Eng. Pat. 12,358, May 31, 1904. Under Internat. Conv., June 3, 1903.

SEE Fr. Pat. 338,842 of 1903; this J., 1904, 823.—T. F. B.

UNITED STATES PATENTS.

Sulphuric Anhydride; Apparatus for Making —. R. Knietzsch, Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, Germany. U.S. Pat. 774,083, Nov. 1, 1904.

SEE Eng. Pat. 15,947 of 1898; this J., 1899, 531.—T. F. B.

Carbonic Acid; Manufacture of —. J. Leslie, Belfast, Ireland. U.S. Pat. 774,092, Nov. 1, 1904.

SEE Eng. Pat. 9142 of 1903; this J., 1903, 1130.—T. F. B.

Ammonia from Distillation Gases; Process for Extracting —. R. Brunck, Assignor to the Firm of Franz Brunck, Dortmund, Germany. U.S. Pat. 773,784, Nov. 1, 1904.

SEE Eng. Pat. 8287 of 1903; this J., 1903, 795.—T. F. B.

Lime; Apparatus for Slaking —. B. C. White, Pittsburg, Pa. U.S. Pat. 773,834, Nov. 1, 1904.

THE machine comprises two horizontal connected end compartments, and an intermediate compartment formed of two exterior and of two intermediate end walls, each integral with each other, and having sheet-metal shells interposed between, connected at their end margins with the exterior and intermediate end walls. Rotating shafts carrying beaters extend longitudinally through the two end compartments.—E. S.

Nickel Oxide and Ammonia; Recovering — [from Nickel-Ammonium Chloride]. H. A. Frasch, New York. U.S. Pat. 773,836, Nov. 1, 1904.

NICKEL-AMMONIUM CHLORIDE is "distilled" in presence of a dehydrating agent, such as a solution of calcium chloride saturated with sodium chloride. The resulting ammonium chloride with "the distilling fluid" from the precipitated nickel oxide is removed, treated with lime, and again distilled, the ammonia being recovered and nickel oxide precipitated. The process is repeated with fresh portions of nickel-ammonium chloride and lime, the "distilling fluid" being constantly enriched "with calcium chloride to any desired degree before finally removing it from the process." Compare U.S. Pat. 762,879, June 21, 1904; this J., 1904, 750.—E. S.

FRENCH PATENT.

Alumina; Manufacture of —. Cie. des Produits Chimiques d'Alais et de la Camargue. Fr. Pat. 339,049, Sept. 19, 1903.

SEE Eng. Pat. 19,924 of 1904; this J., 1904, 1088.—T. F. B.

VIII.—GLASS, POTTERY, ENAMELS.

ENGLISH PATENTS.

Quartz Glass from Quartz Sand, Silica, and the like; Process for the Manufacture of —. I. J. Bredel, Höchst-on-the-Maine, Germany. Eng. Pat. 20,879, Sept. 28, 1904.

SEE Fr. Pat. 343,845 of 1904; this J., 1904, 1028.—T. F. B.

Quartz Glass; Manufacture of Articles from —. I. J. Bredel, Höchst-on-the-Maine, Germany. Eng. Pat. 20,880, Sept. 28, 1904.

SEE Fr. Pat. 344,170 of 1904; this J., 1904, 1090.—T. F. B.

UNITED STATES PATENT.

Pot-Furnace for Melting Glass. W. T. Nicholls, Wellsburg, W. Va. U.S. Pat. 774,600, Nov. 8, 1904.

THE furnace consists of a long narrow combustion chamber of tunnel form with reversing regenerators connected to opposite ends. A series of similar transverse pots with closed tops are set in the furnace chamber with their ends opening through the side walls of the tunnel, each pot having a feed-in opening at one side, and a work-out opening at the opposite side, and a transverse partition with a hole in its lower part to allow glass to flow from what constitutes the melting-chamber to the work-out chamber. The furnace-chamber allows the gases to sweep from end to end over the series of pots; means are arranged whereby the glass is cooled in the work-out chamber.—A. G. L.

IX.—BUILDING MATERIALS, CLAYS, MORTARS AND CEMENTS.

Lime; Hydraulic — H. Seger and E. Cramer.
Thonind. Z., 1904, 28, 1535—1536.

THE proportions of lime and silica in the best hydraulic limes, is such that whilst the burnt mass will set under water, there is sufficient lime to make the whole to fine powder. The resistance of the product to water is not influenced by the quantity of alumina, but varies inversely with the amount of lime present. Undissociated silica reduces the value of the article. The assumption of Le Chatelier that the most suitable composition for hydraulic lime is 1 equivalent of silica to 4 of lime, is not confirmed by practical experience, a portion of the silica being left undissociated, and the product consequently containing an excess of lime. Iron oxide and alumina act as fluxes, and facilitate the dissociation of the silicates. The burnt lime is spread out in a thin layer, sprinkled with water, and then piled into heaps or bins for 10 days, the fine powder being sifted from the lumps. These, known as "grapplers," consist of the underburned and overburned portions, and when ground are mixed to a small extent with the hydraulic lime, to improve its water-resisting power, the rest being sold as grappier cement. The value of this latter depends on its content of calcium silicate; and too large a proportion of underburned material renders it useless. The composition of grappier cement from La Farge is: silica, 31.10; alumina, 4.43; ferric oxide, 2.15; lime, 58.83; magnesia, 1.09; alkalis, 0.94; sulphur trioxide, 0.60; carbon dioxide, 1.28 per cent. Owing to the irregular composition of these grappier cements, their use entails the adoption of special precautions.—C. S.

Refractory Materials in Electric Resistance Furnaces.
F. A. J. FitzGerald. XI. A., page 1151.

ENGLISH PATENTS.

Wood and other Fibrous and Porous Materials or Compounds; Solution for Treating [Waterproofing] —
T. Gare, New Brighton, Cheshire. Eng. Pat. 23,786, Nov. 3, 1903.

RESIN is first dissolved by heating with boiled linseed or castor oil, after which powdered vulcanised rubber or rubber composition is added in small quantities at a time. The mixture is then thinned, if desired, with petroleum, turpentine, &c., and applied to wood, cardboard, felt, or the like, either by immersing the articles in the solution, by forcing the solution through the material, or by simply coating the surface with the solution, in which case a hot roller may afterwards be passed over the surface. For treating wood or cardboard, equal parts of rubber and resin are mixed with 10 per cent. of boiled oil; for treating fibrous material like felt, the proportions of rubber and resin are increased by 25 per cent. In some cases, however, particularly when using a good quality of rubber, the oil may be omitted altogether. The quantity of thinning liquid used varies with the degree of porosity of the material to be treated.—A. G. L.

Refractory Material; Process of Manufacturing —
R. Middleton, Leeds. Eng. Pat. 28,731, Dec. 31, 1903.

PORTLAND cement is intimately mixed with 5 to 8 per cent. of starch, in the form of a concentrated solution, the mixing being preferably carried out in a steam-jacketed apparatus. The mixture is then moulded under pressure, and the resulting bricks, slabs, &c., are very carefully dried, after which they are burnt.—A. G. L.

Bricks, Tiles, Slabs, and the like; Manufacture of —
C. H. Thompson, Stourbridge, Staffs. Eng. Pat. 28,733, Dec. 31, 1903.

WASTE pieces of glass, either alone or mixed with blast-furnace slag, potsherds, pieces of earthenware or porcelain, sand, or clay, are ground and moulded by pressure, with or without preliminary damping, after which they are burnt for five hours at a temperature of 900° to 1200° C.

During the burning the articles are prevented from adhering to each other by being encased in a refractory powder, e.g., ground flint or, preferably, a mixture of equal parts of plaster of Paris and sand. In the case of very refractory materials, a flux, such as waste flint glass, lead borate, or felspar, may be added to the mixture to promote agglomeration. A composition giving good results is the following:—500 kilos. of opal and window glass, 250 kilos. of glazed china potsherds, 10½ kilos. of lead borate.

—A. G. L.

Slag Wool, Silicate Cotton, or Mineral Wool; Manufacture of — G. A. Nelson, trading as F. McNeill and Co., London. Eng. Pat. 4275, Feb. 20, 1904.

As it is blown by the steam, air, or other pressure jet, the slag wool is deposited on a vibrating travelling band sieve or vibrating inclined riddle. By this means the different grades of the wool produced are intermingled, and the glassy particles, known as "shot," are caused to fall through the meshes of the sieve and separated.—A. G. L.

UNITED STATES PATENTS.

Lime; Apparatus for Slaking — B. C. White.
U.S. Pat. 773,834, Nov. 1, 1904. VII., page .

Fireproof Paint or Coating E. R. Stowell, Portland, Ind., Assignor to A. B. Nettleton, Chicago, Ill. U.S. Pat. 774,003, Nov. 1, 1904.

THE composition consists of about equal parts of finely powdered silicon carbide and "semi-liquid" water-glass (sodium silicate), to which may be added calcium carbonate in such quantity that the product contains from 3 to 10 per cent. of this substance.—A. S.

X.—METALLURGY.

Dry Air Blast; Application of —, to the Manufacture of Iron. J. Gayley. Iron and Steel Inst., Oct. 1904.

THE author has effected considerable economy in the working of blast-furnaces by reducing the moisture in the air blast to a low and practically constant amount. The plant used for drying the air comprises two ammonia compressors (one in reserve), condensers, a refrigerating chamber, and a brine-tank. The compressors are of the following dimensions: high-pressure steam-cylinders, 28½ ins. diam.; low-pressure cylinders, 56 ins. diam.; compressor cylinder, 22½ ins. diam.; stroke, 36 ins. Each compressor has "a capacity of 225 tons ice-melting effect." The brine-tank contains 20 coils of double piping, the inner pipe of 2 ins. and the outer of 3 ins. diam., immersed in a calcium chloride brine of sp. gr. 1.21. The brine returning from the refrigerating chamber flows into the top of the tank, and is then forced by a pump through the inner pipe, wherein it is cooled below 32° F. by the ammonia flowing in the opposite direction through the annular space between the inner and outer pipes. The refrigerating chamber contains 60 vertical lines of coils, in each of which there are 75 pipes each 20 feet long, the whole representing 90,000 feet of 2-in. piping. The pipes in each vertical coil are placed in "staggered" position to insure better contact with the air. The series of coils is divided into three sections. The cooled brine from the brine-tank is fed into the coils through a 4-in. "header," and discharges into a 6-in. "header," from which it passes to a stand-pipe, and thence back to the brine-tank. Air is forced into the refrigerating chamber by a blower, and in order to secure its uniform distribution, two electric fans are arranged in the space beneath the coils. The air deposits its moisture in the form of water or frost on the lower pipes and as frost on the upper pipes, and passes from the top of the chamber to the blowing engines of the blast-furnace at a temperature of 32° F., or below, and with a practically constant content of moisture. To remove the deposited frost, the supply of cold brine is cut off from several vertical lines of coil at a time, and brine which has been heated by means of steam is forced through by an auxiliary pump for a short time. In practice it is sufficient to thaw the frost off the pipes every three days. As showing the economy effected by the

used of the dry air blast, it is stated that prior to its employment, in a period of 11 days, the daily production of iron in the blast furnace was 358 tons, with a consumption of 2,147 lb. of coke per ton of iron, whilst, after the introduction of the dry blast, in one period of 16 days, the production of iron was 447 tons with a consumption of 1,726 lb. of coke per ton; and, in another period of 14 days, 452 tons of iron with a consumption of 1,729 lb. of coke per ton. It was found necessary with the dry blast to reduce the speed of the blowing engine, whereby the efficiency of the latter was increased by 14 per cent. When the blowing engines were working at 96 revolutions per minute with the dried air, nearly 1 per cent. more coke was burnt and 89 tons more pig iron were produced in 24 hours than when the engines were working at 114 revolutions per minute with ordinary air. The author estimates that the saving in power consumption in the blowing-engine room would nearly or quite compensate for the requirements of the plant for drying the air. The gases from the furnace for 10 days prior to the introduction of the dry blast contained 22.3 per cent. of carbon monoxide and 13 per cent. of carbon dioxide, and had an average temperature of 588° F. When the dry blast was used, the gases contained 19.9 per cent. of carbon monoxide and 16 per cent. of carbon dioxide, and had an average temperature of 376° F. Other advantages resulting from the use of the dry blast are: the reduction of the loss of ore dust in the escaping furnace gases from 5 to 1 per cent; the possibility, with the saving in coke consumption, of the use of ores higher in phosphorus in the manufacture of Bessemer iron; the fact that owing to the absence of irregularities in the working of the furnace, the silicon can be kept low without increasing the sulphur, in the manufacture of basic iron; and the obtaining of a uniform product with respect to grade and composition. It is suggested that the application of the dry blast to the Bessemer converter and in other processes where air is used in large quantities, particularly in smelters and copper converters, in the open-hearth furnace and in cupolas, would also be advantageous. (See Eng. Pats. 11,091 of 1900 and 19,333 of 1903, and Fr Pat. 344,399 of 1904; this J., 1901, 27; 1904, 22 and 1095.)—A. S.

Cast Iron; Use of Manganese Ore as a Desulphurising Agent in the Smelting of —. Wodemeyer. Stahl u. Eisen, 1904, 24, 1316—1321.

CONTRARY to the statements of Reusch (this J., 1902, 861) and Wüst (this J., 1903, 1294), the author finds that small additions (1—1.4 per cent.) of manganese ore in the cupola furnace have little influence on the proportion of sulphur in the iron produced. Larger additions (4—4.5 per cent.) prevent the transference to the iron of the sulphur contained in the coke, but do not remove any of the sulphur contained in the pig iron used as raw material. The cost of desulphurisation by means of such large additions of manganese ore

is, however, high, whilst at the same time the burning off of the silicon and iron is favoured. Moreover, the sulphur in the iron can be kept within the requisite limits by a suitable addition of limestone, a much cheaper material than manganese ore.—A. S.

Hard Steels; Microstructure of —. W. J. Kurbatoff. Russ. phys.-chem. Ges., Oct. 1904. Chem.-Zeit., 1904, 28, 1107.

THE action of different etching materials was first tried, to ascertain which was the most delicate. Solutions of nitric and picric acids in water, alcohols, organic acids or anhydrides were used, and it was found that the etching was proportional to the ionisation. The most satisfactory reagent was a 5 per cent. solution of nitric acid of sp. gr. 1.3 in isoamyl alcohol. By means of this, differences in the structure of soft, brittle, and non-brittle steels, and lamellar nickel-steels were shown. A mixture of 1 part of a 4 per cent. solution of the same nitric acid with 1 part of methyl, ethyl, and amyl alcohol coloured the troostite and sorbite alone in 7—10 minutes. The hardness of austenite crystals varies in the groups themselves. The microstructures of steels specially rich in carbon, containing 1.9 per cent., show (1) that the texture depends on the different transformation periods of sorbite and cementite; (2) that with high temperatures, troostite with dark crystals on a bright ground results, with still higher temperatures, bright crystals on a dark ground; (3) that the texture of martensite alters in tempering; (4) that on tempering at high temperatures, troostite and cementite pass into ferrite and cementite, the latter decreasing.—F. S.

Gold Bullion; Notes on —. A. C. Claudet. Inst. of Mining and Metall., Bull. No. 2, Nov. 10, 1904.

THE author recommends that bars of bullion from the cyanide process, assaying below 800 fine, be "toughened" before being exported. For this purpose the bars are re-melted in clay crucibles holding 1000—2000 oz. of metal, and the molten bullion is stirred up after addition of sodium nitrate, the nitrate slag being removed by skimming. Successive additions of nitrate are made until the slag remains colourless. The cost does not exceed $\frac{1}{8}$ — $\frac{1}{4}$ d. per oz. of bullion. The nitrate slags may be dissolved and any gold present collected from the residues, or may be re-melted, or used in melting the cyanide precipitate in the first instance. The saving which might be effected by the mining companies is shown in the following table, in which the total fine gold in each case is taken as 500 oz.; the price of gold, 85s. per oz. fine; the penalty for cyanide bullion under 800 and above 700 fine, a deduction of 3 mils, and under 700 fine, a deduction of 4 mils; refining charge (in England), 2 $\frac{1}{2}$ d. per oz. of gross bullion; and melting charge, $\frac{1}{4}$ d. per oz. of gross bullion.

Weight of Bar in oz.	Assay.	Fine Gold, contents in oz.	Gross Value.	Penalty.	Melting and Refining Charges.	Total Charges.	Net Value.	Value per oz. of Fine Gold.	Loss per oz. of Fine Gold.
625.0	800.	500	£ 2125	Nil	£ s. d. 7 16 3	£ s. d. 7 16 3	£ s. d. 2117 8 9	£ s. d. 4 4 8 $\frac{1}{2}$	..
714.3	700	500	2125	6 7 6	8 18 6	18 6 0	2109 14 0	4 4 4 $\frac{1}{2}$	4
633.8	600	500	2125	8 10 0	10 8 3	18 18 3	2106 1 9	4 4 3	5 $\frac{1}{2}$
1000.0	500	500	2125	8 10 0	12 10 0	21 0 0	2104 0 0	4 4 2	6 $\frac{1}{2}$

—A. S.

"White Precipitate" formed in the Zinc Boxes of the Cyanide Works. A. Prister and B. Bay. J. Chem. Metall. and Mining Soc., S. Africa, 1904, 5, 75—78.

THE authors have made a fairly complete analysis of an average sample of the "white precipitate" formed in the "weak" and "medium" zinc boxes of the cyanide works. The results are given as follows:—Zinc potassium ferrocyanide, $K_2Zn_2[Fe(CN)_6]_2$, 10.45; zinc cyanide, 22.73; zinc hydroxide, $Zn(OH)_2$, 54.79; copper oxide, 0.40; ferric oxide, 1.00; and silica, 1.03 per cent. Traces of calcium, aluminium, cobalt, magnesium, gold, and sulphuric acid were also detected. The loss on ignition amounted to 31.32 per cent. and probably consisted of moisture, includ-

ing that from the zinc hydroxide, and cyanogen from the zinc cyanide, and the zinc potassium ferrocyanide. The authors point out that it would be advantageous to pass the vapours evolved when the "white precipitate" is treated with dilute sulphuric acid in the "clean-up," through working cyanide solution, in order to absorb the hydrocyanic acid they contain.—A. S.

Silver and Cadmium; Alloys of —. T. K. Rose. Proc. Roy. Soc., 1904, 74, 218—230.

THE properties of silver-cadmium alloys were investigated, by determining freezing-point curves, and also micrographically, with the view of ascertaining whether those

richer in silver were more homogeneous than the corresponding silver-copper alloys, and consequently better adapted for making trial-plates to be used in testing the fineness of silver coin and plate. The results are summarised as follows:—1. There is evidence of the existence of the compounds AgCd , Ag_2Cd , Ag_3Cd , Ag_4Cd , and Ag_5Cd . 2. Alloys containing 0—25 per cent. of silver consist of crystals of AgCd , in a matrix of cadmium. These containing 25—40 per cent. are crystals of Ag_2Cd , in a matrix chiefly AgCd . The alloy containing nearly 50 per cent. consists of crystals of a silver-rich substance in a matrix chiefly AgCd , which solidifies at 420°C ., nearly 300° below the freezing point of the crystals. Those containing 50—60 per cent. consist, above 420°C ., of mixtures of two solid solutions, one chiefly composed of AgCd , the other of Ag_2Cd , with traces of the eutectic freezing at 420°C . Those containing above 80 per cent. are mixtures of two bodies at temperatures between the liquidus and solidus portions of the curve representing the equilibrium between the solid and liquid constituents of the alloys, but these unite to form a single solution at temperatures on the solidus. 3. The alloys containing over 80 per cent. of silver do not segregate under ordinary conditions, and are practically homogeneous and uniform. They are very suitable for the manufacture of trial plates. — J. T. D.

Sulphur in Irons and Steels; New Method for the Determination of — H. B. Pulsifer. XXIII., page 1162.

Aluminium; New Use for — Elect. Review, 1904, 45, 70. V., page 1143.

ENGLISH PATENTS.

Steel; Manufacture of — J. W. Duncan, Birmingham, Eng. Pat. 20,468, Sept. 22, 1904.

A KNOWN quantity of oxygen gas is mixed with the air-blast before the latter enters the converter. For this purpose an apparatus may be used in which an air-pump for supplying the blast has an inlet valve for the air and a balance valve for the supply of oxygen contained in a valved reservoir, so that the mixture is, on the down stroke of the piston, forced past a valve into a pipe leading to a chamber whence it passes into the converter.—E. S.

Minerals; Separation of — from Ores and Gangue. H. L. Sulman and H. F. Kirkpatrick-Picard, London. Eng. Pat. 20,419, Sept. 22, 1903.

A CURRENT of steam, air, or other gas, charged with a vaporised or atomised oil, is introduced, preferably into the bottom of the finely-divided pulped ore. It is stated that the minute oil globules, or the condensed vapours of volatile oils, attach themselves to the metalliferous particles in preference to the gangue, and float them up, when they may be skimmed off the surface. Or the pulp may by other means be brought into intimate contact with "oil, and with air or other gas, while the oil is in a state of fine division."—E. S.

Ores; Furnaces for Calcining or Roasting Mineral —, and Desulphurising the same. T. Edwards, Ballarat, Australia. Eng. Pat. 28,464, Dec. 28, 1903.

IN A long, reverberatory furnace, with a plane hearth sloped from the receiving to the discharging end, a series of rotating rabbles, disposed in two or more lines longitudinally, and geared so as to be driven in unison, have paths intersecting on the furnace hearth. There are double water passages into, through, and out of the rabbles wherein water is circulated, and covered passage-ways in the arch of the furnace through which the rabbles can be removed and replaced.—E. S.

Ore Separators and Classifiers; Improvements in certain Descriptions of — E. J. Swyny and S. G. Plucknett, Sydney, N.S.W. Eng. Pat. 19,140, Sept. 5, 1904.

THE inlet and outlet passages of the separator are arranged over the perforated cover of a chamber into which water under pressure is introduced. The ore passes, together with water, down the inlet passage, and meets the jets of

water issuing through the perforated cover of the chamber beneath, whereby the lighter particles of gangue are driven upwards through the discharge passage, and are collected on an inclined shelf, whilst the heavier metalliferous particles settle into a channel leading to discharge spouts.—E. S.

Sulphides from their Ores; Apparatus to be used in the Separation and Recovery of — J. H. Gillies, Melbourne, Australia. Eng. Pat. 20,159, Sept. 19, 1904.

THE process used is that in which particles of sulphides in powdered sulphide ores are acted upon by an acid or saline solution that may cause gas bubbles to attach themselves to such particles, causing them to float upwards and be thus capable of separation. The apparatus consists mainly of a metal tank, in the form of an inverted truncated cone, surrounded by an outer jacket, and communicating at its base with a funnel-shaped extension, leading to an outlet pipe. The receptacle is constructed in the form of annular steps having a fall from their outer towards their inner edges, and within it are arranged a number of annular and angular glass blocks, so as to form an annular series of rings arranged one above another and held in position by metal standards, and as a whole taking the shape of a filtering funnel or inverted cone. The tank is surmounted by a hood, down the outer inclined sides of which the powdered ore is delivered and falls on to an annular baffle, whence it falls step by step downwards, the tank having been filled with the chemical liquid and heated by steam or otherwise. The sulphide particles to which gas adheres work upwards under the annular blocks until they reach annular openings which admit them into the body of the tank, where, losing the gas, they sink, and are discharged by a flow of cold liquid into a receptacle below. The dross, on the other hand, passes down between the jacket and the tank to be separately discharged. There is a ball-and-cock system to maintain the level of the liquid in the tank, and there are means for supplying cool liquid to carry off the solid products from the bottom of the apparatus without disturbing the heated liquid above.—E. S.

Metals; Annealing —, and Apparatus therefor. J. S. L. Alexander and A. Shiels, both of London. Eng. Pat. 23,457, Oct. 29, 1903.

THE molten annealing bath used is mainly or wholly of aluminium, the container of which is heated from a furnace by flues arranged above as well as below the bath. The temperature of the bath is maintained constant, either by attention to the heater, or by means of a thermostatic regulator inserted at about the normal level of the molten metal, and operating a lever connected to a damper in the flue. The container is made deeper at one end than at the other end, so that the pipe or tube introduced for annealing may not lie flat, but at an angle, and also that it may have a tendency to move from one side of the bath towards the other side. Means are provided for introducing articles into, and moving them through, the bath.—E. S.

Zinc [free from Lead]; Extraction of — C. S. Brand, Knowle, Warwick. Eng. Pat. 263, Jan. 5, 1904.

SEE Fr. Pat. 341,345 of 1904; this J., 1904, 827.—T. F. B.

Zinc [free from Lead]; Extraction of — C. S. Brand, Knowle, Warwick. Eng. Pat. 3628, Feb. 13, 1904.

SEE Fr. Pat. 341,346 of 1904; this J., 1904, 827.—T. F. B.

Melting Furnaces. H. J. J. Charlier, Philadelphia, U.S.A. Eng. Pat. 4384, Feb. 22, 1904.

SEE Fr. Pat. 340,625 of 1904; this J., 1904, 827.—T. F. B.

UNITED STATES PATENTS.

Sheet Iron or Steel; Method of Treating — H. H. Goodsell, Leechburg, Pa. U.S. Pat. 774,069, Nov. 1, 1904.

SEE Eng. Pat. 18,746 of 1904; this J., 1904, 1094.—T. F. B.

Metallurgical Process [for Manufacture of Steel]. M. P. Boss, San Francisco, Cal. U.S. Pat. 774,304, Nov. 8, 1904.

FINELY-divided iron ore is fed upon an inclined and heated hearth, discharging into a short vertical shaft, and thence into a basin which receives the molten product. In the heated hearth the ore is subjected to the action of a flame from a hydrocarbon, which is introduced in sufficient amount to present "free" hydrocarbon gas to the reduced metal, whereby it is converted into steel. Compare U.S. Pat. 732,263 to 732,269 inclusive, of June 30, 1903; this J., 1903, 914.—E. S.

Centrifugal Separator [for Ores]. F. B. Pettengill, Los Angeles, Cal., Assignor to S. L. Kistler. U.S. Pat. 774,104, Nov. 1, 1904.

THE separator comprises a fixed framework supporting a movable frame to which a horizontal reciprocating motion is imparted, with sudden stops; and a rotating concentrating cylinder mounted in the movable frame, the frame being provided with annular flanges surrounding the ends of the cylinder, and forming therewith annular channels. Inside the cylinder are stirring and lifting blades, which rotate independently of, and more slowly than it. The plane of revolution of the blades and cylinder is vertical. The outer edges of the lifting blades are nearer the cylinder than the inner edges, and portions of the blades extending longitudinally have a sharp edge close to the surface of the cylinder. Means are provided for feeding the ore-pulp into, and for causing a cleansing liquid to flow through, the cylinder. The concentrate is discharged through the annular channel at one end and the gangue through the corresponding channel at the other end of the separator.—A. S.

Slime; Process of Filtering —. H. R. Cassel, New York. U.S. Pat. 774,319, Nov. 8, 1904.

THE slime-pulp is introduced into a tank containing filter-cells connected to a suction-pump, and is simultaneously agitated and circulated between the cells. The slime is deposited in the form of a "thickened layer" on movable mantles arranged at the sides of the filter-cells, any non-adhering pulp being discharged through the bottom of the tank, and introduced again at the top. Water is introduced into the tank to wash out the "values" from the "thickened layer" of adherent pulp, and finally this adherent pulp is dislodged from the movable mantles by agitation, and discharged through the bottom of the tank. Compare U.S. Pat. 769,938 of Sept. 13, 1904; this J., 1904, 939.—A. S.

Nickel Oxides; Furnace for Reducing and Smelting —. E. R. Maffett, Bayonne, N.J., Assignor to International Nickel Co., N.J. U.S. Pat. 774,591, Nov. 8, 1904.

THE furnace has an open-hearth smelting chamber from which an elongated reducing chamber leads to the chimney. Charging openings are arranged lengthwise in the reducing chamber, beneath which a flue extends, having a damper at each end, and communicating with the chamber at its rear end.—E. S.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(A).—ELECTRO-CHEMISTRY.

Cadmium Cell; Report on the —. H. S. Carhart, G. A. Hamilton, E. B. Rosa, C. H. Sharp, and B. J. Arnold. Chem. News, 1904, 90, 225—227.

THE Committee appointed by the Board of Directors of the American Institute of Electrical Engineers to inquire into the preparation of materials for, and the construction of, the cadmium or Weston cell, have issued a preliminary report. Provisional specifications are given for the preparation of mercury, cadmium sulphate solution, cadmium amalgam, mercurous sulphate and the paste, and for the

construction and filling of the cell. For the cell prepared in accordance with the specifications, the name "Weston Normal Cell" is proposed. The recommendations include the purification of mercury by treatment with a nitric acid solution of mercurous nitrate (Z. Phys. Chem., 33, 611), and subsequent re-distillation in a vacuum at least twice; the preparation of pure cadmium sulphate by re-crystallising the pure commercial salt, and selecting only the clear crystals; and the preparation of cadmium amalgam and mercurous sulphate by electrolytic methods. The H-form of cell is recommended. (See also this J., 1904, 665.)—A. S.

Aluminium Anodes; Colloidal Precipitation upon —. W. R. Mott. Electrochem. Ind., 1904, 2, 444—447.

THE loose incoherent aluminium hydroxide which is formed at an aluminium anode in most electrolytes by the passage of a current, adsorbs acid from the solution, forming a hard, dense, insoluble solid of great insulating power. The thickness of film which would bring about perfect insulation, varies with different solutions. Electrolytes containing acid radicals of high valency (citrate, phosphates, &c.) give films of great specific resistance and high dielectric strength, consequently such films are thinner, and less coulombs are required for their formation.—R. S. H.

Refractory Materials in Electric Resistance Furnaces. F. A. J. FitzGerald. Electrochem. Ind., 1904, 2, 439—444.

THE author deals chiefly with the applications of "silico-carbides," which are compounds of silicon and carbon, sometimes with oxygen, and are characterised as being amorphous and highly refractory; they can be converted into crystalline carborundum at a very high temperature. It is shown that the heat conductivity of these materials is greater than that of good firebrick, so that they are more suitable as a lining for the latter than for replacing it entirely. The electrical conductivity of the heated material is not sufficient to cause much leakage of current when it is used as a furnace lining, at any rate for such temperatures at which it is otherwise suitable. Various methods of moulding and forming articles from silico-carbides are described. Glue, dilute sodium silicate solution and tar may be used as binding agents according to the particular application in view. For articles of great mechanical strength it is preferable to frit the material together by oxidation, a temporary binding agent, such as glue, being employed; the process requires prolonged heating since the oxidation is slow. Carborundum, which is to be preferred for the higher temperatures, may be formed into articles by similar methods or by "re-crystallisation," which is effected by heating the moulded material in the electric furnace to the temperature of its formation, when the grains are found to adhere strongly. The paper concludes with a description of methods suitable for the analysis of the silico-carbides.—R. S. H.

Flours; Bleaching of —, by Electricity. Balland. XVIII. A., page 1157.

UNITED STATES PATENTS.

Electrode; Storage Battery —, and Process of Making Same. E. A. Sperry, Cleveland, Ohio. U.S. Pat. 773,685, Nov. 1, 1904.

CARBONATE of lead produced by precipitation electrolytically, from a solution of a lead salt, is roasted to expel carbon dioxide and leave a highly porous mixture of oxides of lead, consisting of equal parts of litharge and minium. The oxides are mixed with a soluble substance capable of combining with and hardening the lead oxides, and the mixture is applied to a grid or support. The soluble substance is dissolved out, thereby leaving relatively large feeder-pores extending through the porous active material.—B. N.

Furnace; Electric —. C. P. Steinmetz, Schenectady, N.Y., Assignor to General Electric Co., New York. U.S. Pat. 773,821, Nov. 1, 1904.

See Eng. Pat. 15,920 of 1900; this J., 1901, 977.—T. F. B.

Kiln; Electric — F. E. Dickinson, Kendallville, Ind.
U.S. Pat. 773,853, Nov. 1, 1904.

THE body of the kiln includes a treating chamber at its interior with an adjacent heating chamber, or with a series of heating chambers or boxes at its base. An auxiliary perforated floor is spaced from the base of the kiln, so as to form return flues communicating with the bottom of each heating chamber, the auxiliary floor extending into each heating chamber. Walls or partitions extend upwards from the auxiliary floor, forming flues leading from each heating chamber, and discharging into the top of the treating chamber, each wall also separating the treating chamber from one of the heating chambers. Electrodes are arranged within each heating chamber, and produce an arc or arcs for heating the gases, so as to cause a circulation through the treating chamber and back to the heating chambers. Means are used for controlling the circulation, and for preventing the admission of air for the support of combustion, and a continuous circulation of the same air is thus maintained through the several parts. An adjustable inlet to each heating chamber provides the latter with air, and an adjustable outlet in the return flue displaces a portion of the circulating gas.—B. N.

Accumulator Plates; Process of Electrolytically Producing Lead Peroxide Layers upon Positive — J. Diamant, Raab, Austria. U.S. Pat. 774,049, Nov. 1, 1904.

SEE Eng. Pat. 6954 of 1903; this J., 1904, 376.—T. F. B.

Electrolytic Apparatus. A. Brichaux, Brussels, Assignor to the Solway Process Co., Syracuse, N.Y. U.S. Pat. 774,230, Nov. 8, 1904.

SEE Eng. Pat. 7471 of 1898; this J., 1899, 376.—T. F. B.

Flour; [Electric] Process of Treating [Bleaching, &c.] — J. M. Williams. U.S. Pat. 769,522, Sept. 6, 1904, XVIII. A., page 1158.

(B).—ELECTRO-METALLURGY.

Lead, Commercial; [Electrolytic Determination of Impurities in] — A. Hollard and L. Bertiaux, XXIII. page 1162.

Tin; Commercial, and its Alloys; Analysis of — A. Hollard and L. Bertiaux, XXIII., page 1162.

ENGLISH PATENT.

Electrical Separation of Granular Materials; Process of, and Apparatus for the — F. O. Schnelle, Frankfort-on-the-Maine. Eng. Pat. 13,489, June 14, 1904. Under Internat. Conv., June 15, 1903.

SEE Fr. Pat. 344,068 of 1904; this J., 1904, 1098.—T. F. B.

FRENCH PATENT.

Zinc; Process and Furnace for the Electrical Extraction of — A. Edelmann and N. Wallin. Fr. Pat. 344,832, July 16, 1904. Under Internat. Conv., July 23, 1903.

SEE Eng. Pat. 16,205 of 1904; this J., 1904, 1035.—T. F. B.

XII.—FATTY OILS, FATS, WAXES, AND SOAP.

Fats; Enzymic Hydrolysis of — S. Fokin. Chem. Rev. Fett- u. Harz-Ind., 1904, 11, 118—120; 139—141; 167—170; 193—195; 224—226; 244—247.

THERE is no difference in the enzymic action of different varieties of castor seeds, the same amount of fatty acids being liberated from almond oil by seeds from different garden varieties and from the ordinary castor plant. Nor does keeping the seed for a long time appear to have any perceptible influence on its enzymic activity. Variations in the temperature between 20° and 35° C. have also no influence on the results in the case of liquid fats, but when treating solid fats it is advisable to keep the temperature near the higher limit. Constein, Hoyer, and Wartenberg, stated (this J., 1902, 1541) that the amount of water

required to obtain the maximum of hydrolysis stood in relationship to the amount of fat, but the author concludes that the quantity of seeds is the determining factor. If too much water be added, the excess is speedily separated from the emulsion, and the amount retained by the seeds can be calculated fairly closely. Thus in four experiments in which the proportions of seeds were as 8:4:2:1, the amounts of water in the seeds and emulsion were as the respective square roots of these numbers arranged in similar ratio. As regards the influence of the amount of water on the yield of fatty acids, the author concludes that when the castor seeds are used in the proportion of 20 to 40 per cent. the influence of this factor is not very great, but that with smaller amounts of seeds (5 per cent.), variation in the proportion of water has much more effect, this being attributed to the readiness with which small amounts of seed separate from the emulsion. If 40 per cent. of water be used (with 5 per cent. of seed) the glycerin solution will have a concentration of about 20 per cent., whilst if the water used for washing be included, the concentration will be about 7 to 8 per cent. The glycerin requires purification from albuminoid matters, &c. The concentration of the acid (sulphuric, hydrochloric, &c.), must fall within the limits of N/20 to N/120, corresponding to the limits (of seeds employed) 5 to 40 per cent. With small amounts of acid the process is slow, whilst a concentration greater than N/10 may completely destroy the enzymic action of the seed. When the mass is properly mixed the quantity of seed used has no influence, at all events within the limits of 5 and 40 per cent. Under the proper conditions, a yield of 90 to 95 per cent. of fatty acids can be obtained within two to three days. The more thorough the mixing and the greater the amount of fat used the higher the yield of fatty acids. Solid and old (rancid) fats are not so readily hydrolysed. The hydrolysis can be started by means of carbonic acid or by the addition of free fatty acids. The nature of the oil or fat makes little difference, except in the case of those containing fatty acids of low molecular weight. The author states that the fatty acids obtained by this process are susceptible of being rapidly bleached. It is not easy to separate the aqueous glycerin solution from the residue of seeds. The author was unable to obtain the enzyme in the form of a solution. Attempts to use pancreatic juice in a technical process were unsatisfactory, the objections being the cost, the slowness of the hydrolysis, and the constant attention needed for the addition of fresh alkali. Moreover, the final products are inferior to those obtained by the castor seed process, and the glycerin can only be separated by salting out with sodium chloride and alkaline lyes, and is then much more impure than that separated from ordinary soap lyes. (See also this J., 1904, 259, 614).—C. A. M.

Copra Oil; Saponification of — by Cytoplasm. E. Urbain, L. Saugon, and A. Feige. Bull. Soc. Chim., 1904, 31, 1194—1198.

THE presence of free fatty acids in copra oil appears to exert a retarding influence on the saponifying action of cytoplasm. The rate of saponification is found to vary directly with the mean molecular weight of the free fatty acids present. It was ascertained, by arresting the saponification at different times, that the saponification value of the neutral fatty oil remaining, and also the molecular weight of the fats formed was practically constant throughout the operation, whence it is concluded that the saponifying action of the cytoplasm is independent of the nature of the glyceride. This is contrary to the conclusion of Comstein, Hoyer, and Wartenberg (this J., 1902, 1542), viz., that the glycerides of the lower fatty acids were the last to be saponified, but this conclusion was based merely on the saponification of tributyrin; in this case it is pointed out that it is the butyric acid which retards saponification, and experiments are described which show that in the presence of 10 per cent. of butyric acid (on the weight of oil used) no saponification was effected in 24 hours.—T. F. B.

Borneo Tallow; Composition of — J. Klimont. Monatsh. f. Chem., 1904, 25, 929—932.

BORNEO tallow is the name given to the fat obtained from the fruit of different varieties of *Dipterocarpus*. The fat

examined by the author was hard, of a greenish-yellow colour, and gave the following numbers:—Acid value, 15.8; saponification value, 194.6; iodine value, 30.1; and m. pt., 34.5° to 34.7° C. A solution of the fat in ether yielded a crystalline deposit (with iodine value 31.3), when cooled to 16° C. On recrystallising the fat from acetone, after removal of free fatty acids, a compound crystallising in needles was eventually obtained. This melted at 44° C. (37° C. after once melting), and had a saponification value of 188.4 and iodine value of 28.6, and an elementary composition agreeing with the formula of oleodistearin, $C_{2}H_5 \cdot C_{15}H_{31}O_2 \cdot (C_{15}H_{31}O_2)_2$. Further crystallisation of the substances retained in the mother liquid yielded products with relatively high saponification values (218, 218). From one of the fractions with saponification value 198, oleodipalmitin (m. pts., 33°–34° C. and 28°–29° C.) was isolated. It was also concluded that glycerides of still lower fatty acids combined with unsaturated acids were present in the other fractions.

Cacao Butter.—In addition to the oleodistearin found by Fritzweiler an oleodipalmitin has been separated from this fat by the author.—C. A. M.

Cottonseed Oil; Detection of — in Olive Oil.
E. Millian. XXIII., page 1163.

Dégras; Notes on the Analysis of —. G. Baldracco.
XXIII., page 1163.

Cholesterol; New Reaction of —. C. Neuberg and
D. Bauchwenger. XXIII., page 1163.

ENGLISH PATENT.

Fats or Fatty Substances or the like; Cooling Melted —. A. E. Iveson, Gainsborough, and A. R. Wilson, Brighton. Eng. Pat. 25,868, Nov. 26, 1903.

THE fat is heated until liquid or semi-liquid and subjected in a stream to the action of a blast (e.g., of chilled air), which projects it in a state of fine division on to a cooling surface, such as the periphery of a rotating drum, from which it is subsequently scraped. The stream of melted fat may fall vertically and meet the blast issuing from a nozzle at right angles. Claim is also made for special apparatus for this process, which is stated to effect uniform cooling of the fat and to a large extent prevent "seeding."

—C. A. M.

UNITED STATES PATENTS.

Halogenised Fat; Solidified —, and Process of Making same. H. Winternitz, Halle on the Saale, Assignor to the firm of E. Merck, Darmstadt, Germany. U.S. Pat. 774,324, Nov. 8, 1904.

SEE Eng. Pat. 3430 of 1903; this J., 1903, 751.—T. F. B.

Liquids [Crude Glycerin]; Process of Distilling —. W. E. Garrigues, New York. U.S. Pat. 774,171, Nov. 8, 1904.

To prevent decomposition, the liquid (glycerin, &c.) is distilled in an atmosphere of steam. For this purpose the aqueous vapours from a previous distillation may be condensed. This "sweet water" is evaporated at less than atmospheric pressure; the steam produced is superheated and injected into the crude glycerin, or the like, in the still. The superheating is effected by the vapours rising from the still, the glycerin vapours, being simultaneously condensed, giving off their heat to superheat the water vapour.

—C. A. M.

Glycerin; Recovering — from Spent Soap Lyes. W. E. Garrigues, New York. U.S. Pat. 774,172, Nov. 8, 1904.

THE liquid is neutralised with a mineral acid, and after separation of the insoluble fatty acids it is concentrated and then freed from mineral salts and volatile fatty acids, and the concentrated glycerin solution treated with an alkaline substance and distilled. Thus the soap lye may be neutralised with sulphuric acid, and aluminium sulphate added to precipitate the insoluble fatty acids. The filtrate from these is concentrated and the separated mineral salts removed,

after which barium chloride is added and then sufficient sulphuric acid to liberate the volatile fatty acids combined with the alkali. These acids are partially enveloped in the barium sulphate, with which they can be separated from the liquid by filtration, whilst the remaining portion can be expelled by evaporating the liquid in a vacuum evaporator. Finally the solution is treated with sodium carbonate, and the glycerin distilled.—C. A. M.

FRENCH PATENT.

Fatty, Resinous, and other Substances; Process and Apparatus for Extracting — by means of Hot Solvents, without Pressure, and with great Safety as in Methods of Cold Extraction. F. Genoyer. Fr. Pat. 844,919, July 18, 1904.

THE material is extracted by means of a solvent heated to a temperature below its boiling point. The apparatus claimed for this purpose consists of a cylindrical extractor heated by means of a steam coil and connected by means of a pump with a lower reservoir containing the solvent. The temperature within the extractor can be maintained at the required point by the introduction of more cold solvent. After the extraction the solvent is driven into an evaporating vessel containing a steam coil, where it is evaporated at a temperature lower than its boiling point. The vapours are condensed in an adjoining vessel and the recovered solvent falls into the reservoir, whence it can be pumped again into the extractor.—C. A. M.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(A.)—PIGMENTS, PAINTS.

ENGLISH PATENTS.

Oxide of Iron; Kilns applicable for Use in the Manufacture of —. H. W. Hemingway, Walthamstow, Essex. Eng. Pat. 23,550, Oct. 30, 1903.

THE kiln is of the type described in Eng. Pat. 4001 of 1893 (this J., 1894, 163), in which the blocks of copperas to be calcined are placed in a series of calcining pockets or chambers having removable tile covers and hinged floors, the hinges being formed as a single frame. According to the present invention, the movable floor is "hinged to a piece of stout piping," through which water is constantly circulated, the effect of which is that the destruction of such hinge by burning is prevented. The heating is conducted on the regenerative system. There are passages for supplying air and gas alternately to each of two sets of flues, the front and rear flues alternating laterally with the calcining chambers. The waste gases discharged traverse refractory material, whereby in turn the incoming air is heated before mixing with the gaseous fuel. There is special apparatus to facilitate the charging of the kiln with the blocks of copperas, and the extremities of the calcining chambers are provided with protecting curbs, having grooves into which iron covers fit, in order to diminish the wear to which the brickwork round the upper extremities of the calcining chambers is subject.—E. S.

Lakes [from Azo Dyestuffs]; Manufacture of New Colour —. H. E. Newton, London. From Farbenfabr. vorm. F. Bayer & Co., Elberfeld, Germany. Eng. Pat. 1389, Jan. 19, 1904.

SEE Fr. Pat. 339,606 of 1904; this J., 1904, 713.—T. F. B.

UNITED STATES PATENT.

Fireproof Paint or Coating. E. R. Stowell, Assignor to A. B. Nettleton. U.S. Pat. 774,003, Nov. 1, 1904. IX., page 1148.

FRENCH PATENT.

Colours with a Base of Magnesium Carbonate (Giobertite). Mme. la Princesse Dénidoff (née O. Lapoukhine). Fr. Pat. 339,045, Nov. 26, 1903.

THE finely-powdered mineral, giobertite, can be used as the base for colours intended to resist a high temperature

on metallic surfaces, such as stoves or boilers. Oil varnish, glue, &c. are added according to the requirements.

—C. A. M.

(B.)—RESINS, VARNISHES.

ENGLISH PATENT.

Lac-Derivatives; Preparation of — [for Lining Cans for Preserved Food]. W. S. Bucklin, Phalanx, N.J., U.S.A. Eng. Pat. 16,800, July 30, 1904.

THE lac is heated in an inert medium, such as water or coal-gas, to a temperature above its melting point, so as to eliminate volatile constituents and leave a residue melting at a higher temperature and not imparting any flavour to food. A suitable method consists of heating the lac in water for 28 to 30 hours at a high pressure and temperature (320° to 352° F.). Ordinary shellac thus treated yields a tasteless product, which becomes slightly soft when heated, but is capable of resisting a very high temperature (e.g., 590° to 600° F.) without charring or decomposing. Certain other lacs are converted into corresponding products in a much shorter time. For coating the interior of cans, &c. the substance is mixed in a finely-divided state with alcohol (in which it is only partially soluble) and inert colouring matters, &c. if required. The surface is painted with this preparation, which, on evaporation of the alcohol, leaves an adhesive coating of the solid material.

—C. A. M.

UNITED STATES PATENTS.

Linoleum; Manufacture of — L. W. Seeser, Raguhn, Germany. U.S. Pat. 773,995, Nov. 1, 1904.

SEE Eng. Pat. 17,971 of 1903; this J., 1904, 906.—T. F. B.

Cement [for Securing Linoleum and the like]. F. Suter, Berlin. U.S. Pat. 774,286, Nov. 8, 1904.

THE cement consists of molasses (e.g., 55 kilos.), asphalt distillate (5 kilos.), rosin (25 kilos.), and alcohol (5 kilos.), with or without the addition of copal (10 kilos.).

—C. A. M.

FRENCH PATENTS.

Fatty, Resinous, and other Substances; Process and Apparatus for Extracting — by means of Hot Solvents, without Pressure, and with as great Safety as in Methods of Cold Extraction. F. Genoyer. Fr. Pat. 344,919, July 18, 1904. XII., page 1158.

Cement for Linoleum and similar Substances. F. B. Suter. Fr. Pat. 344,820, July 15, 1904. Under Internat. Conv., July 21, 1903.

SEE U.S. Pat. 774,286 of 1904, preceding these.—T. F. B.

(C.)—INDIA-RUBBER, &c.

Latex of Castilloa Elastica and its Coagulation. C. O. Weber. Gummi-Zeit., 1904, 19, 101—104.

THE author, in reply to de Jong and Tromp de Haas (this J., 1904, 990, 1036), maintains his view that the rubber is not contained in the latex as rubber, but in the form of a fluid oil surrounded by an albuminous covering. That the covering is albuminous and not cellulose or of a resinous nature is proved by its giving the iodine reaction, no zinc iodide reaction, and in its being insoluble in alcohol. The author first observed the fluid nature of the rubber under the microscope, and verified it by shaking out with ether. On pressing the cover-glass the albuminous sac bursts and the contents are discharged, rapidly becoming a solid mass, owing, the author considers, to a polymerisation process, which view is confirmed by Harries' well-founded polymerisation of myrcene and dimyrcene, as well as by the author's observations of the ethereal extract of the *Castilloa* latex. De Jong and Tromp also state that solidified latex of *Castilloa* rubber is soluble in ether, but the author repeats his statement that ether does not dissolve it. He has found that incompletely polymerised india-rubber forms thick jellies with ether, which he regards as emulsions, not solutions, whereas

highly polymerised qualities are absolutely insoluble in that solvent, simply swelling more or less. De Jong and Tromp de Haas, on shaking out the latex or milk, with ether, obtained 9 per cent. rubber solutions, which even then were thick and could not be filtered, whilst the author obtained 43 per cent. solutions, thin and easily filtered. The author also confirms his statement that *Castilloa* latex contains no tannic acid, but a considerable quantity of albuminous matter, up to 7 per cent. These bodies appear analogous to the caseins, and gave a strong biuret reaction. De Jong and Tromp de Haas quite fail to appreciate the difference between coagulation and precipitation, as they speak of the coagulation of rubber by means of alcohol, acetone, &c., which is purely precipitation and simultaneous polymerisation. The author is convinced that the sample of rubber examined by them cannot have been a genuine sample of *Castilloa elastica*.—J. K. B.

Caoutchouc; Study of Different Kinds of — Examination of some Latexes in Sicily. C. Harries. Ber., 1904, 37, 3842—3848.

THE author examined freshly-collected specimens of the latex of *Ficus magnolioides* Borci and *Ficus elastica*.

Latex of Ficus magnol. Borci.—On extracting the latex with ether a dark-coloured, aqueous liquid was left containing a reducing sugar. The ethereal extract was separated by filtration from mucous matter, probably consisting of albuminoid bodies, and, after evaporation of the ether, formed a bright yellow syrup, which on standing partially crystallised. By repeated treatment with small quantities of ether, the syrup was separated into a crystalline, oxygenated compound, (C₁₀H₁₆O)₂, and a white, elastic mass, possessing all the properties of pure Para caoutchouc, except that when first isolated it was soluble in ether.

Latex of Ficus elastica.—This latex behaved in quite a similar manner to the latex of *Ficus magnol. Borci*, except that the oxygenated constituent, (C₁₀H₁₆O)₂, had a lower molecular weight, and was present in smaller amount. In the latex of *Ficus elastica* the oxygenated compound and the caoutchouc are present in about equal amounts, but in the latex of *Ficus magnol. Borci* the oxygenated body forms the chief constituent. The author concludes that Weber's view (see this J., 1903, 1200), that the rubber-yielding constituent of the latex is probably an aliphatic diester, C₂₀H₃₂, which is readily polymerised, has no sufficient basis. (See also this J., 1904, 990, 1036).—A. S.

India-Rubber Articles; Analysis of — W. Esch and A. Chwolle. XXIII., page 1163.

ENGLISH PATENTS.

Substitute for India-Rubber; Manufacture of an Improved — H. Tiehsen, Berlin. Eng. Pat. 17,579, Aug. 12, 1904.

THE rubber substitute is prepared by heating a solution of amber resin in castor-oil with sulphur at a high temperature (180° C.), cooling the mass, and treating it first with ozone and then with sulphur chloride in presence of a solvent, such as benzol, and of calcium carbonate.—A. S.

Cork; Process of Making a Substitute for — [from Rubber], and the Article Produced by said Process. H. Birkbeck, London. From F. H. Brooks, Baltimore. U.S.A. Eng. Pat. 21,101, Oct. 1, 1904.

SEE U.S. Pat. 774,645 of 1904, following these.—T. F. B.

UNITED STATES PATENTS.

Cork Substitutes [from India-Rubber]; Process of Making — F. H. Brooks, Baltimore, Md. U.S. Pat. 774,645, Nov. 8, 1904.

RUBBER is dissolved in a suitable solvent, the solution mixed with sulphur and then with a "pulverised base," after which the mass is heated at a low temperature to drive off the solvent. The mixture obtained is moulded, and finally vulcanised.—A. G. L.

Rubber; Process for Reclaiming and Regenerating —.

L. T. Petersen, Assignor to J. F. McGuire, Akron, Ohio.
U.S. Pat. 774,727, Nov. 8, 1904.

VULCANISED rubber is regenerated by heating it in a 10—15 per cent. solution of caustic soda to a temperature near its boiling point, a pressure of about 200 lb. per sq. in. being applied, and then heating it further with a solution of a soluble hydrocarbon or hydroxy-hydrocarbon (e.g., a 1—10 per cent. solution of phenol) in a closed vessel, to a temperature of 300°—375° F., whereby the fabric is dissolved.—T. F. B.

XIV.—TANNING; LEATHER, GLUE, SIZE.

Tannins; Preparation and Elementary Composition of some Technically Important —. T. Koerner and A. Petermann. Deutsch. Gerber-Zeit., 1904, 47, 115—126. Chem.-Zeit., 1904, 28, Rep. 328. (See also this J., 1904, 1115.)

THE substances were extracted with hot alcohol and the filtered solutions precipitated with ether. The first two fractions obtained by fractional precipitation, were found to differ considerably in composition, the last fractions very little. The following results were obtained from the last fractions:—

Tannin from	Carbon.	Hydrogen.
	Per Cent.	Per Cent.
Quebracho.....	63.79	4.51
Oak wood.....	53.05	4.81
Chestnut wood.....	51.28	4.40
Mimosa bark.....	57.87	5.87

Thus a quebracho tannin is easily distinguishable from others by its high percentage of carbon. Other tannins which contain catechu tannin (e.g., gambier and catechu) were also found to contain about 62 per cent. of carbon, but can be recognised by the fact that they contain catechin.—T. F. B.

Tanning Infusions and Extracts; Action of Saline Substances on —. E. Nihoul. Bull. Assoc. Belg. Chim., 1904, 18, 185—198; 220—228.

THE action of saline substances on infusions of tanning materials is slight in the case of sumach; but in the case of oak and pine, sodium sulphate causes a loss of tannin, without, however, increasing the turbidity, which is always present even when the extraction has been made with distilled water. This loss may be due to a partial conversion of the tannin into substances not assimilable by the hide, or to the formation, with the salt in question, of a compound that is not retained by hide powder. Possibly also the salt modifies the osmotic power of the hide, though no trace of tannin is found in the liquid after passing through a Procter filter. Moreover, the salt acts differently with infusions of quebracho, no loss of tannin occurring in concentrated solutions of this material. In other instances the quantity of the precipitate formed is increased at the expense of the tannin, e.g., with salts of lime and magnesia, though in some cases these also behave like sodium sulphate, partially converting the tannin into soluble non-tannin. The latter sometimes plays a part in the formation of turbidity. Generally speaking, the presence of saline substances in natural waters increases the loss of tannin occurring during the process of extraction. This loss is increased by prolonging the exposure, precipitates being subsequently formed in the clear liquids that have been used for analysis. For example, after the lapse of a fortnight, all the oak solutions had become turbid, except the one containing calcium chloride, which exhibited traces of mycelial vegetation. In the case of pine infusion, however, the conditions were reversed; and of the sumach solutions, only that containing magnesium bicarbonate gave a deposit, the others remaining clear. On the other hand, all the solutions containing this last-named salt deepened in colour. With regard to the loss of tannin

sustained during the process of extraction, it is found to be advisable, when using water charged with mineral matters, to grind the tanning materials as fine as possible, in order to diminish the loss, though this treatment increases the number of fragments of cell-substance and therefore lowers the purity of the product. The tannin extracts examined gave results similar to those furnished by the infusions, though the proportion of loss was smaller. The slight irregularities observed with the extracts may be due to differences of manufacture.—C. S.

UNITED STATES PATENTS.

Dégras; Note on the Analysis of —. G. Baldracco. XXIII., page 1168.

Washing and Tanning Hides or Skins; Device for —. R. Koenitzer, St. Louis, Mo. U.S. Pat. 773,878, Nov. 1, 1904.

A DRUM capable of being rotated is mounted upon a tanning-vat. The periphery of the drum is composed of strips arranged at intervals apart. The strips have one edge bevelled and the other straight, and each alternate strip is detachable. The fixed strips are provided with pins for suspending the hides to be tanned.—A. S.

Leather; Method of Making —. W. Macmillan, Palmerston North, New Zealand. U.S. Pat. 774,260, Nov. 8, 1904.

SEE Eng. Pat. 19,661 of 1902; this J., 1903, 876.—T. F. B.

FRENCH PATENTS.

Leather; Artificial —, and Process of Making same. R. Picabergen. Fr. Pat. 344,787, July 13, 1904.

SEE Eng. Pat. 15,639 of 1904; this J., 1904, 906.—T. F. B.

XVI.—SUGAR, STARCH, GUM, Etc.

Rowan Berries; A New Sugar from —. G. Bertrand. Comptes rend., 1904, 139, 803—805.

VINCENT and Meunier (this J., 1999, 58) detected the presence of a substance in the mother-liquors from the crystallisation of sorbitol, which they regarded as an octite. The author has now prepared this substance, and finds it to be a hexavalent alcohol, a new isomeric of mannitol and sorbitol; he names it provisionally *sorberitol*. The mother-liquors are separated from the crystals of sorbitol, the sorbitol remaining in them is converted into sorbose by fermentation with the sorbose bacterium, the sorbose is precipitated by alcohol, and the residual syrup is treated with sulphuric acid and benzaldehyde. Sorberitol is regenerated from its benzal compound and recrystallised; it occurs in the form of anhydrous prisms, melting at 75° C. and is very deliquescent in moist air. Its rotatory power in 10 per cent. solution at 20° C. is $[\alpha]_D = -3.53^\circ$. Two benzal derivatives are described: the dibenzal compound, fairly soluble in boiling alcohol and melting at 192° C., and the tribenzal compound, only sparingly soluble, and melting at about 240° C. The hexacetate of sorberitol is prepared by the action of acetic anhydride in presence of zinc chloride; it crystallises in hexagonal plates melting at 123° C., and possessing a rotatory power of $[\alpha]_D = -26.66^\circ$ in 5 per cent. solution in chloroform.—J. F. B.

Reducing Sugars; Separation or Isolation of — by means of Aromatic Hydrazines. G. Votoček and K. Vondráček. XXIII., page 1164.

Rhodoase and Fucose; Enantiomorphism of —. G. Votoček. XXIV., page 1165.

Isomeric Glucosides and Galactosides; Hydrolysis of — by Acids and Enzymes. E. F. Armstrong. XXIV., page 1165.

Sucroclastic Actions of Acids and Enzymes; Contrast between the —. E. F. Armstrong and R. J. Caldwell. XXIV., page 1165.

ENGLISH PATENTS.

Filters [for Sugar Solutions]. W. Kathol, Vailsburg, N. J., U.S.A. Eng. Pat. 11,854, May 24, 1904. Under Internat. Conv., July 3, 1903.

A RECTANGULAR bag of filter-cloth has a sleeve formed at one of the upper corners, the bag being otherwise completely closed. A delivery pipe is inserted into the sleeve and passes along inside the upper edge of the filter-bag to the opposite corner. The bag is caused to assume a series of vertical folds by placing a clip along the lower edge. Several of these bags are placed in a closed or open tank, the delivery pipes passing water-tight through a series of holes formed on the upper part of one side; the other end of the tube, inside the bag, resting on a ledge on the opposite side of the tank. The liquid to be filtered enters the tank by a pipe in the bottom, and the liquid passes through the filtering cloth into the bag, up the spaces formed by the folds and away by the delivery pipes to a trough on the outside of the tank, the insoluble matter remaining on the outside of the filter cloth.—W. H. C.

Gum Tragacot; Manufacture of— from Locust Kernels. R. Gray, G. Osborn, H. B. Stocks, and H. G. White, Hooton, Cheshire. Eng. Pat. 27,186, Dec 11, 1903.

THE kernels are boiled for about ten minutes in water, and, after draining off the water, are kept moist for about 24 hours. They are then passed through one or more ordinary brush decorticating machines until the shells are removed. If any colouring matter from the shells or the shells themselves are mixed with the kernels, the latter or the gum extracted from them must be treated with a soluble aluminium salt or a bichromate, in order to precipitate the colouring matter as a lake. The clear gum is then decanted off.—T. H. P.

UNITED STATES PATENT.

Starch, Soluble; Apparatus for Making —. W. Browning and J. J. Barlow, Accrington. U.S. Pat. 773,788, Nov. 1, 1904.

SEE Fr. Pat. 336,903 of 1903; this J., 1904, 449.—T. F. B.

FRENCH PATENTS.

Molasses; Process for Separating — from Non-Saccharine Substances. F. Hlavati. Fr. Pat. 344,969, July 19, 1904.

SEE Eng. Pat. 16,750 of 1903, this J., 1904, 874.—T. F. B.

XVII.—BREWING, WINES, SPIRITS, Etc.

Malt; Presence of the Cell Wall in the Endosperm of Finished —. A. R. Ling. *Brewers' J.*, 1904, 40, 741—742.

In their researches on the germination of the *gramineæ* (this J., 1890, 530), Brown and Morris explained the phenomenon of "modification" as being "co-terminous with the dissolution of the cell wall," i.e., they concluded that, as germination progresses, the cell wall enclosing the starch granules of the endosperm is attacked and hydrolysed by the action of an enzyme which proceeds from the scutellum and gradually extends, throughout the whole endosperm, with the result that the "mealiness" of the latter, which is characteristic of full modification, is to be regarded as the consequence of the complete disintegration and solution of this cell wall. In 1896, Grüss (this J., 1896, 464) showed that this view is incorrect, at any rate, so far as Continental malts are concerned, and that the cell walls, although they are modified to some extent by the action of the enzyme and are made invisible except when suitably stained, are still present in the finished malt. Since the original view of Brown and Morris has remained to a large extent prevalent in this country, the author has conducted experiments in order to decide whether the longer germination which is given to English malts really does result in the complete dissolution of the cell wall in the endosperm, as suggested by those observers. For this

purpose sections were cut from finished English malt corns, both in the longitudinal and transverse directions. When these sections were examined, after staining with Congo red, the cell wall was plainly discernible in all of them and was, moreover, practically continuous throughout the whole endosperm. This observation is illustrated by microphotographs, two of which (Figs. 1 and 2) are here given.

FIG. 1.

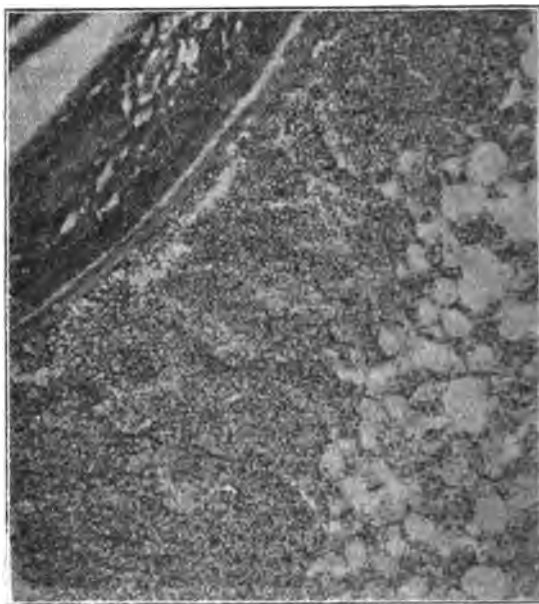
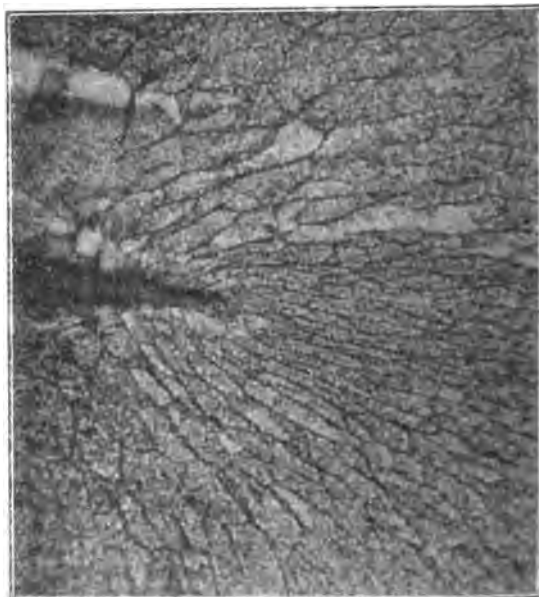


FIG. 2.



Hence it is shown that the conclusions of Grüss are equally valid for English malts as for German malts, and it is suggested that the modification of the cell wall, which does undoubtedly take place, is confined to some less resistant constituent of this wall (e.g., the araban), the products of the hydrolysis of which will probably be found as part of the carbohydrate constituents of the aqueous extract of the malt.—J. F. B.

Malt; Action of Formaldehyde on the Diastatic Power of —. Somlo and von Laszloffy. Oesterr. Chem. Zeit.; through Brewers' J., 1904, 40, 735.

The authors steeped green malt for a short time in solutions of formaldehyde, afterwards washing out the latter and determining the diastatic power. In all cases the formaldehyde was found to have had a remarkable stimulating influence on the diastatic power of the malt, but on the other hand the addition of formaldehyde produced no increase in the diastatic powers of malt extracts. The reason for this influence is so far unexplained, but the treatment has been practised on the large scale in the distillery (see this J., 1904, 674), the malt being immersed for two hours in a 2 per cent. solution of formaldehyde. The authors consider that their observations tend to confirm the hypothesis that formaldehyde plays a part in the degradation of starch in the green plant.—J. F. B.

Saccharomycetes; A New Member of the Family of the —. H. Schioning. Woch. f. Brau., 1904, 21, 691—693 and 717—720. Comptes rend. trav. Lab. de Carlsberg, 1903, 6, 103.

The author has isolated from the earth of a meadow on the St. Gothard a species of a new genus of yeast, which he has named *Saccharomycopsis capsularis*. It develops rapidly in wort in the form of ellipsoid and oval cells resembling those of *S. Pastorianus*. On the second day small surface growths of mycelial cells appear, and after about a month the film which has formed on the surface may have reached a thickness of 2 cm. In yeast-water media the mycelium readily develops asci, each ascus containing four spores. The individual spores are round in one direction and oval in profile; they possess a double membrane, a character which constitutes the chief differentiation between this new genus and that of the *Saccharomycetes*. When viewed in profile, the spores show a fine line or seam which divides them into two unequal parts. When the spores germinate, the exosporium splits open down this seam, forming two capsules jointed together at one point, whilst the new cells grow out by budding from the open side and show an early tendency to assume the mycelial form. When the growth of yeast is treated with strong sulphuric acid, the whole of the mycelium and yeast cells dissolve, leaving behind the spores, which are resistant to the action of the acid but which show a characteristic rose-red coloration. This coloration is attributed to the presence of a cork-like constituent in the exosporium. Growth on solid substrata have a greyish-white, silky appearance; they liquefy gelatin and on some media they become red or brown in colour. This yeast ferments maltose, dextrose, levulose and *d*-galactose, but not arabinose, raffinose, milk sugar, nor cane sugar; it secretes no invertase. The optimum temperature for vegetative growth in beer wort and for sporulation is from 25° to 28° C. Sporulation does not occur above 35° C and no growth takes place above 32.5° C. In beer wort containing 13.5 per cent of total solids, this yeast produced 5.66 per cent of alcohol by volume after 27 days and 7.15 per cent. after 7 months at the ordinary temperature. The description of the new genus *Saccharomycopsis* is:—Budding and endosporeogenous yeasts; the spore possesses two membranes and germinates by budding. The only species yet known are; *S. capsularis*, described above, and *S. guttulatus*, Robin, previously called *Cryptococcus guttulatus* or *Saccharomyces guttulatus*, first discovered by Robin in the intestine of the rabbit.—J. F. B.

Wort; Running off the — from the Mash. Pankrath. Woch. f. Brau., 1904, 21, 699—704.

In running off the wort from a decoction mash through the false bottom of the clearing-tun, a certain speed must not be exceeded, if the drainage is to be satisfactory, and for this reason means, such as pressure, suction, &c., intended to hasten the process have never met with success. If the wort be run off too rapidly, the flocculent matters of the grains are so compressed that portions of the bed do not part with their liquor readily. One method is worthy of further attention; it consists in agitating the mash during the whole of the running off of the main wort and disregarding the consequent turbidity of the latter, but removing this turbidity at a later stage by filtration. The

author has plotted curves showing the variations of density of the main wort running from different taps. Theoretically the density should remain constant at all stages, but in reality it varies at different stages and different taps. This circumstance is attributed to the water used for rinsing various parts of the apparatus before and after the transference of the mash and to leakage of the sparging pipes; such water does not mix completely with the mash, but is localised mainly at the top and bottom. When all the main wort has drained off, the bed of grains is raked up and is then more permeable than before. The author has studied the principle of the sparging process in the laboratory, working by upward displacement. On varying the speed of the washing water it was found that a faster current of water gave a more rapid extraction but that it required a vastly greater quantity of water to complete the exhaustion. Hence the necessity of sparging slowly in order not to dilute the beer too largely. Curves were plotted showing the progress of extraction during sparging on the large scale, and the variations in the density of the liquors running from different taps according to the different areas drained by each and to variations in the permeability of the bed. These curves always descend very rapidly at first, but if the middle portion be too steep it shows that the taps are open too widely, with the result that irregularities will be encountered towards the end, when, owing to equalisations caused by the last liquors draining away, the density of the runnings will actually rise again after their collection has been stopped. So far as yield is concerned, it makes no difference whether the bed of grains be raked over once or several times, and the author shows that time is saved by not raking more than once, i.e., at the beginning of the sparging; but if there are pockets of grains which are so compacted as not to yield up their wort to the sparging water, the bed may with advantage be raked up in the wet state without draining off.—J. F. B.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(A.)—FOODS.

Flours; Bleaching of — by Electricity. Balland. Comptes rend., 1904, 139, 822—823.

The author has examined a sample of flour produced by the ordinary methods, and one of the same flour bleached by treatment with electrified air. The colour of the latter was distinctly whiter, but its odour and flavour were less agreeable. The only modifications produced by bleaching capable of being detected by analysis were those of the fatty matters and the acidity. The fats, after the electrical treatment, had become slightly rancid, they were less fluid and paler in colour; the yellow oil of the wheat, which is highly aromatic in freshly ground flour, had been oxidised and partially converted into white fatty acids, soluble in absolute alcohol. The acidity of the flour had increased from 0.0147 per cent. before treatment to 0.0196 per cent. after treatment. The examination of the gluten and experiments on the bread-making properties of the flour showed that the electrical treatment had not only bleached the flour but had also "aged" it, with loss of flavour.—J. F. B.

Celery; Constituents of —. M. Bamberger and A. Landsiedl. Monatsch. f. Chem., 1904, 25, 1030—1034.

In addition to mannitol, the authors have found that asparagine and tyrosine are normal constituents of celery. The amount of asparagine isolated from the root-stalks of different specimens of the plant was nearly the same, 62 grms. of the fresh material yielding 0.3 grm., whilst the amount of tyrosine was very small. Leucine could not be detected.—C. A. M.

ENGLISH PATENTS.

Milk Powder; Production of Milk in the Form known as —, applicable also to the Treatment of other Solutions containing Fatty Matter. R. B. F. Butler, Devizes, Wilts. Eng. Pat. 5946, March 10, 1904.

The milk, or any analogous solution, is first forced through fine sieves or bodies furnished with fine orifices or passages,

and is then dried at a high temperature. The preliminary sifting process breaks up the fatty particles and fixes them in the liquid, so that, when the resulting powder is dissolved in water, the fat does not rise to the surface.—T. H. P.

Lac-Derivatives; Preparation of — [for *Living Cans for Preserved Food*]. W. S. Bucklin. Eng. Pat. 16,800, July 30, 1904. XIII B., page 1154.

UNITED STATES PATENTS.

Flour; Process of Treating —. [Bleaching, &c.] J. M. Williams, Guthrie, Okla. U.S. Pat. 769,523, Sept. 6, 1904.

THE process consists in decomposing, by electrolysis, water or other liquid containing oxygen, and by means of a blast of air introduced below the level of the liquid, bringing the gaseous products formed into contact with the flour.

—W. P. S.

Vacuum Apparatus [for Milk]. M. Ekenberg, Assignor to Martin Ekenberg's Aktiebolag, Stockholm, Sweden. U.S. Pat. 774,054, Nov. 1, 1904.

SEE Eng. Pat. 23,770 of 1902; this J., 1903, 158.—T. F. B.

(B.)—SANITATION; WATER PURIFICATION.

ENGLISH PATENTS.

Liquid Sewage or Sewage Effluent; Apparatus for Distributing — upon Filter-Beds. H. W. Taylor, Newcastle-on-Tyne. Eng. Pat. 28,379, Dec. 24, 1903.

THE distributor consists of two parallel pipes placed between two water-wheels of comparatively long length and small diameter. The pipes and water-wheels extend across the filter-bed and are mounted at each end on a wheeled carriage, the carriages running on rails laid on the walls of the filter-bed. Openings are provided in the pipes for the delivery of the sewage to the wheels. The sewage supply trough is parallel to the side of the filter and is connected by means of a siphon to a valve box in communication with the parallel pipes. The ends of the latter are alternately opened and closed at each end of the filter-bed by a lever-valve. The carriage is provided to travel backwards and forwards over the filter by the movement of the water-wheels, the axles of the latter being extended to form the axles of the carriage wheels. The end of the siphon in the supply trough is automatically opened and closed, according to the flow of sewage, by means of a valve actuated by a lever and inverted bell, or by an ordinary ball-float. A tapped chamber at the top of the siphon is provided in order to start the action of the siphon.

—W. P. S.

Sewage; Method of and Apparatus for the Bacterial Purification of —. C. Kremer and R. Schilling, Berlin. Eng. Pat. 20,889, Sept. 28, 1904.

THE apparatus consists of a vertical rotating wheel, around the circumference and on the spokes of which boxes are suspended so that they always remain in an upright position. The boxes are filled with filtering or oxidising material, such as coke, slag, &c., and are so arranged that they can be automatically removed and replaced by fresh boxes. Sewage flowing into the boxes causes the wheel to rotate, the liquid drains through from each box into the next lower one, and finally into an outlet channel. The rotation of the wheel produces a strong current of air, and the filtering material is thus subjected to aeration both while covered with sewage and during the period between the draining of the filtered liquid and the reception of a fresh charge of sewage. When the sewage is under only a small "head," a horizontal wheel, rotated by external means, is used, with the boxes of oxidising and filtering material arranged around the rim.—A. S.

UNITED STATES PATENT.

Waste Liquors; Device [Straining Apparatus] for the Purification of —. H. Riensch, Charlottenburg, Germany. U.S. Pat. 773,593, Nov. 1, 1904.

SEE Eng. Pat. 8896 of 1902; this J., 1902, 1064.—T. F. B.

FRENCH PATENTS.

Furnace; Refuse Consuming and Gas Producing —. L. Tobiansky. Fr. Pat. 344,699, April 23, 1904.

SEE Eng. Pat. 12,361 of 1904; this J., 1904, 878.—T. F. B.

Garbage and other Organic Waste; Apparatus for Extracting the Oil from —. C. S. Wheelwright and J. T. Fiske, jun. Fr. Pat. 844,811, July 15, 1904.

SEE Eng. Pat. 14,483 of 1904; this J., 1904, 879.—T. F. B.

Oil and Fatty Matters from Garbage and similar Organic Refuse; Apparatus for Extracting —. C. S. Wheelwright and J. T. Fiske, jun. Fr. Pat. 344,812, July 15, 1904.

SEE Eng. Pat. 14,482 of 1904; this J., 1904, 879.—T. F. B.

Liquids from Solid Matters; Apparatus for Extracting —. [Treatment of Refuse.] C. S. Wheelwright and J. T. Fiske, jun. Fr. Pat. 344,910, July 15, 1904.

SEE Eng. Pat. 14,484 of 1904; this J., 1904, 909.—T. F. B.

Oil and Fatty Matter from Garbage and other Organic Refuse; Process and Apparatus for Extracting —. C. S. Wheelwright and J. T. Fiske, jun. Fr. Pat. 345,046, July 15, 1904.

SEE Eng. Pat. 14,709 and 15,235 of 1904; this J., 1904, 879 and 909.—T. F. B.

(C.)—DISINFECTANTS.

Mercuric Chloride; A New Cause of the Dissociation of — and its Influence on the Antiseptic Properties of Solutions thereof. H. Wittenet. Bull. Soc. Chim., 1904, 31, 1033—1038.

IT is found that solutions containing mercuric chloride and ammonium chloride (as used for disinfecting purposes) when made with tap water, become turbid on dilution, and a white precipitate eventually forms. On washing this with cold water, a yellowish substance was obtained, having the composition NH_4HgCl_2 . The conditions necessary for the formation of this precipitate are those associated with "temporary hardness," and solutions made with distilled or even with boiled water remain quite clear when diluted. By replacing the ammonium chloride by sodium chloride, the nature of the water used has no influence on the stability of the resulting solutions. The original white precipitate, which is obtained in quantity when sodium carbonate or bicarbonate is present, appears to have the composition $\text{NH}_4\text{HgCl}_2 \cdot 3\text{NH}_4\text{Cl}$. In contact with water it dissociates into NH_4Cl and NH_4HgCl_2 , the latter oxidising in contact with air and moisture.

—T. F. B.

ENGLISH PATENT.

Disinfecting; Improved Method of —. A. Morgan, London. Eng. Pat. 21,053, Sept. 30, 1904.

ONE part of paraformaldehyde and six parts of carbon, both in a finely-powdered condition, are mixed with sufficient gum tragacanth or other suitable gum to form a stiff paste, which is pressed into blocks and dried. When required, the blocks are ignited, whereby formaldehyde vapour is gradually and uniformly disseminated.—A. S.

XIX.—PAPER, PASTEBOARD, Etc.

Wood Fibre; Chemical Investigation of —. V. Grafe. Monatsh. f. Chem., 1904, 25, 987—1029.

FROM the results of experiments described in detail, the author concludes that Wiesner's reactions for woody fibre (viz., yellow coloration with aniline salts, red coloration with phloroglucinol and hydrochloric acid, and colorations given by other phenols) are due to the action of these respective substances on certain constituents of the wood fibre, the hydrochloric acid playing an accelerating part. He finds that wood fibre is not a chemical individual, but consists, in the main, of vanillin, methylfurfural, and pyrocatechol, together with coniferin which is partly combined

with the cellulose in the form of an ester, partly in the resin, and partly to a small extent in the free state in the membrane. He confirms the statement of Tiemann and Haarmann and of Höhnelt as to the occurrence in wood of small amounts of coniferin, to which must be attributed the blue coloration in the test with phenol, hydrochloric acid, and potassium chlorate. Vanillin can also be detected in the refuse sulphite lyes from the cellulose manufacture. The green coloration given by wood with concentrated hydrochloric acid (or better with hydrobromic acid) is in all probability due to the methylfurfural in conjunction with the coniferin. The intensity of the colorations in the different reactions must be attributed to the fine state of diffusion of these bodies by means of the resin, and to the capacity of the cellulose to retain substances that have penetrated into it, as well as to the sensitiveness of the reagents. Wood fibre has on the average a methyl value of 48. The possibility of preparing methylfurfural and pyrocatechol in a simple manner from cellulose, and the fact that there is nothing against the vanillin in the ligneous membrane having a similar origin, render Wiesner's reactions uncertain tests of lignification. The reddish-brown coloration in the so-called Maule's reaction (which consists of treating chips of wood for five minutes with 1 per cent. potassium permanganate solution, washing them in water, then placing them in dilute hydrochloric acid, until the manganese dioxide disappears, and finally exposing them to the fumes of ammonia) is also attributed by the author to the same substances that give the colorations with Wiesner's reagents.—C. A. M.

Paper Pulp; Beating of — and Longitudinal Splitting of the Fibres. E. Kirchner. *Wochenbl. f. Papierfahr.*, 1904, 35, 3411—3414.

By pressing and stamping the fibres of paper half-stuff in a porcelain mortar, it was found that the property of splitting up easily and completely in a longitudinal direction is characteristic of the class of bast fibres: linen, hemp, and jute. The production of these long fine filaments or fibrillæ, which are of such great value in paper-making, is due to the radial planes of cleavage and concentric ring structure of the bast fibres; the pointed ends of the fibres do not split so easily. The characteristic knots and cross markings of the linen and hemp fibres disappear in the process of stamping; these two fibres split up in an exactly identical manner. This property accounts for the three stages of disintegration which are the foundation of modern methods of beating, i.e., "free" beaten stuff, in which the bast fibres are chopped up with sharp knives; "fine" beaten stuff, consisting of chopped fibres the ends of which are subsequently split up to a greater or smaller length into tufts of fibrillæ, and "wet" beaten stuff, in which a certain proportion of the fibres are completely split up into long fibrillæ, which lie in tangled masses between the still perfect fibres. Each method of beating imparts definite characters to the paper. The structure of the cotton fibre is very different from that of the bast fibres. In cotton the cell wall consists of a resistant outer layer or cuticle which cannot be split, and an inner layer which is capable of yielding fibrillæ, which, however, are not axial, but interlaced together in spiral strands or network. This structure makes the splitting of the fibre difficult and always incomplete, since the interlacing presents no longitudinal planes of cleavage. The fibrillæ only appear after prolonged stamping and are confined to the ends of the fibres or to places where the cuticle has been chipped off. They always preserve their netted form and consequently do not extend for any great length. The fibrillæ of cotton have a coarser, softer character than those of the bast fibres and their edges are less sharply defined. In the case of those fibres which have been crushed very flat without breaking the cuticle, this latter and the spiral inner layers of the cell appear to be welded together in a gelatinous, shapeless mass. The fibre of wood-cellulose presents on disintegration an appearance similar to that of the cotton fibre, but it is far less capable of withstanding energetic mechanical treatment. Its structure consists of an outer layer which does not split, and an inner layer of spirally interlaced strands, but it breaks up into short pieces, when sharply beaten, far

more readily than cotton. With more gradual treatment there is a slight tendency to form fibrillæ at the ends, similar to those of cotton, but the main bulk of the fibres are entirely broken down, the outer layer appearing in the form of irregular fragments and the inner layers as a slimy, cloudy mass which shows a filamentous, tangled structure under high magnification. The resulting paper is, however, transparent and brittle, though capable of withstanding a high tensile strain.—J. F. B.

ENGLISH PATENTS.

Wood and other Fibrous and Porous Materials or Compounds; Solutions for Treating — T. Gare. Eng. Pat. 23,786, Nov. 3, 1903. IX., page 1148.

Celluloid Non-inflammable; Process for Rendering — W. C. Parkin, A. Williams, and T. Casson, Sheffield. Eng. Pat. 28,212, Dec. 23, 1903.

SEE Fr. Pat. 344,501 of 1904; this J., 1904, 1111.—T. F. B.

UNITED STATES PATENTS.

Paper [and Ink]; Safety Commercial — J. Rowan, Ottawa, Canada. U.S. Pat. 774,535, Nov. 8, 1904.

SEE Eng. Pat. 3909 of 1904; this J., 1904, 453.—T. F. B.

Cellulose; Manufacture of — C. Kellner, Vienna. U.S. Pat. 773,941, Nov. 1, 1904.

SEE Fr. Pat. 326,313 of 1902 and Addition thereto; this J., 1903, 817 and 1304.—T. F. B.

Horn-like Substance; Elastic —, and Process of Producing same [from Acetyl Cellulose]. L. Lederer, Sulzbach, Germany. U.S. Pat. 774,677, Nov. 8, 1904.

SEE Addition, of Aug. 22, 1902, to Fr. Pat. 319,724 of 1902; this J., 1903, 563.—T. F. B.

Cellulose Acetate [Horn Substitute]. W. H. Walker, Newton, Mass. U.S. Pat. 774,713, Nov. 8, 1904.

SUBSTITUTES for horn, celluloid, &c., are produced by heating under pressure a stable cellulose derivative, such as cellulose acetate, with a phenol, such as thymol. Other claims relate to "a new composition of matter" containing acetyl-cellulose, thymol, and chloroform. (Compare Lederer, Addition of Aug. 22, 1902, to Fr. Pat. 319,724 of 1902; this J., 1903, 563.)—T. F. B.

Cellulose Acetate. W. H. Walker, Newton, Mass. U.S. Pat. 774,714, Nov. 8, 1904.

A CELLULOSE ester of a fatty acid (e.g., cellulose acetate) is "modified" by addition of thymol and castor oil, and the mixture is "attached to a support."—T. F. B.

FRENCH PATENT.

Paper Pulp or other Fibrous Pulp; Apparatus for Beating, Triturating, and Refining — J. H. Annandale. Fr. Pat. 345,044, July 11, 1904. Under Internat. Conv., Nov. 28, 1903.

SEE Eng. Pat. 26,012 of 1903; this J., 1904, 1040.—T. F. B.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Colloidal Silver Salts. C. Paul and F. Voss. Ber., 1904, 37, 3862—3881.

THE authors describe the preparation and properties of colloidal carbonate, phosphate, sulphide, chloride, bromide, and iodide of silver. These colloidal salts were obtained by the action of the corresponding alkali salts on the adsorption compound of colloidal silver oxide (this J. 1904, 994) with sodium protalbinat or lysalbinat (this J. 1904, 996).

—A.S.

Rare Earths of the Yttrium Group, near to Gadolinium.
G. Urbain. Comptes rend., 1904, 139, 736—738.

In separating fractionally the yttria earths, after the faintly rose-coloured europium oxide and the white gadolinium oxide, coloured oxides appear, each successive fraction being darker than the preceding one. The darkest fractions show with intensity the spectrum of dysprosium. Those nearer gadolinium give an absorption band at $\lambda = 488$ identical with that mapped by Lecoq de Boisbaudran in 1895, and attributed by him to an element provisionally designated Z3. By three separate methods of fractionation (nickel-earth nitrates, earth-nitrates with intercalation of bismuth nitrate, and ethylsulphates) the author has separated fractions showing only the band $\lambda = 488$. The oxides from these solutions are all brown, and contain peroxides; it has not yet been possible to decide whether these oxides are mixtures of dysprosium and the element Z3, or whether they also contain another element which shows no absorption spectrum.—J. T. D.

Alkaline Earth Tartrates; Solubility of — in Water.
H. Cantoni and Mlle. Zachovers. Bull. Soc. Chim., 1904, 31, 1121—1124.

The solubility of the normal tartrates of strontium, calcium and barium was determined by heating the salt with water at a constant temperature for 10 hours; the amount dissolved was determined, in the case of strontium tartrate, by evaporation, and with calcium and barium tartrates, by precipitation with ammonium oxalate. The results obtained as the mean of several experiments are as follows:—

Temperature, °C.	Grms. of Salt dissolved in 100 c.c. of Water.		
	Strontium Tartrate, $\text{C}_4\text{H}_6\text{O}_6\text{Sr} + 3\text{H}_2\text{O}$	Calcium Tartrate, $\text{C}_4\text{H}_6\text{O}_6\text{Ca} + 4\text{H}_2\text{O}$	Barium Tartrate, $\text{C}_4\text{H}_6\text{O}_6\text{Ba}$
2	0.12138	0.03664	0.02125
21	0.21280	0.04777	0.02505
23		0.04888	0.02842
30	0.31542	0.08765	0.03577
9	0.47885	0.12522	0.04398

Since barium tartrate is much less soluble than calcium tartrate, it is suggested that a barium salt might be used for decomposing the potassium tartrate in the manufacture of tartaric acid. A table of solubilities, calculated from the above figures, is given for temperatures from 0° to 60° C. inclusive, at intervals of 5°.—T. F. B.

Thioformic Acid. V. Auger. Comptes rend., 1904, 139, 798—800.

PHOSPHORUS pentasulphide, P_2S_5 , does not react with formic acid even at the boiling temperature, but sodium metathio phosphate, NaPS_3 , obtained by heating together equimolecular proportions of phosphorus pentasulphide and sodium sulphide, reacts readily with formic acid in the cold, with evolution of sulphuretted hydrogen. On distilling the product at 30°—40° C. *in vacuo*, and condensing the distillate at a temperature of about 20° C., crystals of unaltered formic acid are obtained, together with a very unstable liquid possessing the properties of a thio-acid, but which decomposes after a short time, depositing a white amorphous substance with evolution of sulphuretted hydrogen. Analysis indicated that this liquid contained about 35 per cent. of *thioformic acid*, H.COSH . Sodium thioformate was also obtained by Kekulé's method, by mixing phenyl formate with sodium hydrosulphide dissolved in absolute alcohol, the salt being precipitated by ether after the removal of some of the alcohol by distillation. Sodium thioformate crystallises in very deliquescent, long, white needles. Its aqueous solution gives coloured precipitates with salts of the heavy metals, which, however, are very unstable. The free acid was prepared by treating the sodium salt with formic acid in the cold, and distilling the product *in vacuo*, but a study of its properties was not possible, owing to its extreme tendency to polymerise, with loss of sulphuretted hydrogen.—J. F. B.

Papaverinium Bases. H. Decker, O. Klausner, and M. Girard. Ber., 1904, 37, 3809—3815.

An account is given of the preparation and properties of the normal bromobutylate of papaverine, butyl-iso-papaverine, papaverinium chlorobutylate, the iodo-isobutylate, p-nitrochlorobenzylate, isodropylate, and iodo-isopropylate of papaverine, monobromopapaverine, *N*-methylbromopapaverinium salts, *N*-methylbromo-iso-papaverine, bromopapaverine chlorobenzylate, and *N*-benzylbromo-iso-papaverine. By the oxidation of *N*-benzylbromo-iso-papaverine, *N*-benzylidimethoxy-iso-quinoline and 6-bromoveratric acid are produced. (See also this J., 1904, 336.)

—A. S.

Terpenes and Essential Oils; 70th Communication; Compounds of the Thujone Series. O. Wallach. Annalen, 1904, 336, 227—280. (Compare this J., 1902, 1244.)

THE author has turned his attention to the possible existence in essential oils of more than one modification of thujone, and has isolated two physically different isomeric forms of this ketone from suitable fractions of various oils, by preparing the semicarbazones under conditions excluding the possibility of isomeric changes, and separating the semicarbazones by fractional crystallisation. *α*-Thujone is levorotatory ($\alpha = -9^\circ$ to -10°); it forms two semicarbazones, one crystallising in rhombic prisms, m. pt. 186°—188° C. $[\alpha]_D = +59.5^\circ$, sparingly soluble in ether; the other amorphous, melting at 110° C., dextro-rotatory to about the same degree as the first, but very soluble in ether. *β*-Thujone is dextro-rotatory ($\alpha = \text{about } +70^\circ$); it forms a semicarbazone which is dimorphous, and which is obtained as hexagonal prisms, melting at 174°—175° C., which are stable at low temperatures, but which change at ordinary temperatures into rhombic prisms melting at 170°—172° C. The two isomeric thujones are partially converted, one into the other, under the action of alcoholic potash, but *β*-thujone is the more stable form. Both thujones are converted by alcoholic sulphuric acid into isothujone, but the *α*-thujone is first transformed into *β*-thujone. Both yield the same *α*-thujaketonic acid when oxidised by permanganate. As regards the occurrence of these two forms of thujone in essential oils, the author has established the fact that thuja oil contains practically only *α*-thujone; tansy oil contains practically only *β*-thujone [tanacetone]; wormwood oil contains principally *β*-thujone together with a little *α*-thujone; the oils of *Artemisia barrelieri* and of sage contain mixtures of the two isomerides. The second part of the paper deals with the isoxime of thujone, the oxime of isothujone, the isoxime of thujamenthone, and the isoxime of hydroxythujamenthone.—J. F. B.

Morphine; Contribution to the Knowledge of Alkaloidal Reactions. IV. — C. Reichardt. XXIII., page 1163.

Codeine in Opium; Determination of —. C. E. Caspari. XXIII., page 1164.

UNITED STATES PATENT.

Chloral; Process of Continuously Producing and Rectifying —. J. A. Besson, Caen, France. U.S. Pat. 774,151, Nov. 8, 1904.

SEE Eng. Pat. 17,202 of 1900; this J., 1901, 1139.—T. F. B.

FRENCH PATENTS.

Protocatechuic Aldehyde; Process for Preparing — by Means of Heliotropin. Franz Fritzsche and Co. Fr. Pat. 344,837, July 16, 1904. Under Internat. Conv., Oct. 29, 1903, and March 10, 1904.

SEE Eng. Pat. 15,784 of 1903; this J., 1904, 1043.—T. F. B.

Alkylaminoacetopyrocatechols; Process for Preparing —. Farbwerke vormals Meister, Lucius und Brüning. Fr. Pat. 344,930, July 18, 1904. Under Internat. Conv., Aug. 15, 1903.

SEE Eng. Pat. 26,480 of 1903; this J., 1904, 1043.—T. F. B.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

UNITED STATES PATENT.

Photographic Process for the Reproduction [in Relief] of Plastic Objects. C. Baese, Berlin. U.S. Pat. 774,549, Nov. 8, 1904.

SEE Eng. Pat. 5381 of 1902; this J., 1902, 1469.—T. F. B.

XXII.—EXPLOSIVES, MATCHES, Etc.

ENGLISH PATENT.

Explosives; New or Improved —. C. J. Rusher, Cape Town, and G. W. Baudinet, Cape Colony. Eng. Pat. 7490, March 29, 1904.

To a mixture of ammonium nitrate (5 parts) and dinitrobenzene (1 part) from 0.5 per cent. to 2.5 per cent. of ammonium carbonate is added. The ammonium nitrate is heated to 90° C. and the ammonium carbonate added. The dinitrobenzene is melted, and part is impregnated with ammonia gas, the whole being mixed together hot to form the finished explosive.—G. W. McD.

UNITED STATES PATENTS.

Chlorate Powder. W. M. Spore, Argenta, Ill. U.S. Pat. 739,356, Sept. 22, 1903.

AN explosive, consisting of chlorate of potash, white of egg, and pith of cornstalks.—T. F. B.

Blasting Powder. J. Tollner, Assignor to F. G. Dokken-wandel and H. M. Grant, New York. U.S. Pat. 757,693, April 19, 1904.

THE explosive consists of potassium nitrate (15 per cent.), sodium nitrate (30 per cent.), sulphur (15 per cent.), spent tan bark (20 per cent.), horse manure (20 per cent.).

—T. F. B.

XXIII.—ANALYTICAL CHEMISTRY.

INORGANIC—QUALITATIVE.

Acetates, Cyanides, and Lithium; Method for the Detection of —. S. R. Benedict. Amer. Chem. J., 1904, 32, 480—483.

Acetates. — The method which is capable of detecting acetates at a dilution of N/500, and is applicable in presence of all strong acids, and of all weak acids having insoluble silver salts, is based upon the facts (1) that unlike most weak acids, acetic acid has a soluble silver salt, and (2) that the acidity or degree of ionisation of acetic acid is greatly reduced by the presence of an acetate. The solution to be tested is freed from all cations, except those of the sodium group, made just alkaline with sodium carbonate, and treated with excess of silver nitrate. After filtering, the excess of silver is precipitated from the perfectly neutral solution by N/1 sodium chloride solution, and after again filtering, the liquid is saturated with hydrogen sulphide, and added to 3 c.c. of N/1 cobalt nitrate solution, which has been acidulated with two or three drops of N/1 acetic acid, and saturated with hydrogen sulphide. (A slight precipitate of cobalt sulphide may be present in the latter solution, but may be disregarded.) A copious black precipitate of cobalt sulphide forms immediately if the test solution contained an acetate.

Cyanides. — For the detection of cyanides in presence of thiocyanates and ferrocyanides, a method based upon the action of cyanides on the freshly precipitated oxides of mercury is recommended. The solution to be tested is made alkaline with sodium hydroxide, and 0.5 to 1 c.c. of N/25 mercurous nitrate solution is introduced so as to form a layer above the alkaline solution, a ring of black mercurous oxide being produced at the junction of the two liquids. The whole is then gently agitated so that the precipitate slowly mixes with the solution. If cyanide be

present, a portion of the precipitate will dissolve whilst the rest will become light gray in colour, owing to the formation of metallic mercury. The test is a more delicate one than the Prussian blue reaction.

Lithium. — The solution to be tested is made alkaline with ammonia, one-tenth of its volume of N/5 disodium-hydrogen phosphate solution is added, followed by enough alcohol to produce a fairly heavy precipitate, which remains permanent on shaking. The liquid is then heated to boiling. If lithium be absent, the precipitate will completely dissolve, but if present, lithium phosphate will be precipitated upon warming, and the precipitate will not dissolve even on boiling. If the amount of lithium present be small, the solution will first become clear, and the precipitate of lithium phosphate will form on boiling.—A. S.

Strontium and Strontium Chromate; Microchemical Detection of —. W. Autenrieth. Ber., 1904, 37, 3882—3887.

STRONTIUM chromate exhibits a strong tendency to crystallise, and is thus distinguishable from barium chromate, which precipitates in the amorphous form. If to a drop of N/4 strontium nitrate solution on a microscope slide, a drop of 10 per cent. potassium chromate solution be added, the precipitate under a magnification of 120 diameters shows bundles or brushes of fine needle-like crystals, highly characteristic. If the strontium solution be N/10 or weaker, the precipitate falls only after some time, and then consists of short single or modified hexagonal prisms, requiring a magnification of about 500 to exhibit them clearly. The same crystals are obtained when ammonia in excess is carefully floated on a solution of strontium chromate in acetic acid or a mineral acid. This form seems to be unstable, and tends to pass gradually into the needle-like form. Moist strontium chromate readily dissolves in acetic acid; dried at 120° C. it is more slowly attacked, but in time dissolves completely. When, for purposes of analysis, an acid solution of strontium chromate is reduced by alcohol and precipitated by ammonia, the hydroxide, even after re-solution and precipitation, obstinately retains such quantities of strontia as to make the chromium determination quite worthless. Stock's method of precipitation by potassium iodide and iodate is quite applicable to strontium chromate. For the detection of barium, strontium, and calcium together, the author recommends separation of the thoroughly dried chlorides by alcohol, and examination of the residue for barium, precipitation of a drop of the filtrate by potassium chromate, and microscopic examination for strontium; the rest of the filtrate is converted into nitrates, and these are separated by alcohol. Separation by potassium sulphate solution is not to be recommended.

—J. T. D.

Nitrogen; Automatic Apparatus for the Absorption of — from Gaseous Mixtures. F. Henrich. VII., page 1146.

INORGANIC—QUANTITATIVE.

Sulphates; Volumetric Determination of Soluble —. M. Monhaupt. Chem.-Zeit., 1904, 28, 1125—1126.

THE method given is for the determination of sulphates in alkali and alkaline-earth salts. A weighed quantity of the substance is dissolved in water, and a solution containing known quantities of sodium carbonate and of potassium hydrate is added in excess to precipitate lime and magnesia. The solution is then made up to a known volume, and filtered. An aliquot portion of the filtrate is neutralised with hydrochloric acid, using methyl orange as indicator. The solution is then boiled to expel carbon dioxide, and a known quantity of standardised barium chloride solution added. After cooling, the solution is made up to a known volume, and a portion of the filtrate titrated with sodium carbonate solution, phenolphthalein being used as indicator. The titration can be performed accurately, if about from one-third to one-half part of 80—90 per cent. alcohol be added to the solution, and the mixture warmed. The lime and magnesia originally present may be determined by using a known excess of standardised sodium carbonate and potassium hydroxide in the first instance, and titrating a portion of the filtrate with standard acid solution, using

methyl orange and phenolphthalein as indicators. From the amounts of sodium carbonate and potassium hydroxide consumed, the quantities of lime and magnesia respectively can be calculated. For instance, a mixture of 15 grms. of salt (containing 0.31 per cent. of sulphuric anhydride), 5 grms. of magnesium sulphate, and 5 grms. of crystallised magnesium chloride, was dissolved in 250 c.c. of water. 40 c.c. of the solution were then precipitated with 50 c.c. of the caustic-carbonate liquor, made up to 200 c.c., the liquid filtered, and 100 c.c. (containing 2 grms. of the mixture) of the filtrate neutralised and boiled. 20 c.c. of N/2 barium chloride solution were added, and 100 c.c. of the cooled and filtered solution then required 6.75 c.c. of N/2 sodium carbonate solution. This corresponded to 6.50 per cent. of sulphuric anhydride and a gravimetric determination gave 6.65 per cent.—L. F. G.

Sulphates and Chlorides; Use of the Chromates of Barium, and of Silver in the Determination of —.
L. W. Andrews. Amer. Chem. J., 1904, 32, 476—480.

Sulphates.—The author recommended some years ago (this J., 1890, 328) a method for the volumetric determination of sulphates, consisting in adding a reagent prepared by dissolving barium chromate in dilute hydrochloric acid, to the sulphate solution, neutralising, filtering, and titrating the chromate in the filtrate iodometrically. It has been pointed out, however, that the solution of barium chromate in hydrochloric acid does not maintain its strength on keeping (this J., 1892, 711; 1898, 694). The author now finds that this objection is completely removed if trichloroacetic acid be substituted for hydrochloric acid. Trichloroacetic acid in concentrations between N/1 and N/3 is capable of maintaining permanently in solution one-sixth of its own weight of barium chromate, and the solutions do not appreciably alter on keeping, so far as the concentration of chromate is concerned.

Chlorides.—The principle of using a re-precipitable salt can also be applied to the determination of chlorides, especially to the colorimetric determination of small amounts, as for example, in water-analysis. Finely-divided silver chromate is agitated with the dilute chloride solution, the liquid is filtered or decanted, and its colour matched with that of a solution containing a known amount of potassium chromate. —A. S.

Perchlorate; Reduction [Determination] of — in the Wet Way. B. Sjollem. Z. anorg. Chem., 1904, 42, 127—128.

POTASSIUM perchlorate is quantitatively reduced to chloride by boiling with ferrous hydroxide in the absence of free alkali. 0.4 grm. of potassium perchlorate was treated with a solution of 40 grms. of ferrous sulphate crystals in about 100 c.c. of water and 25 c.c. of sodium hydroxide solution (sp. gr. 1.33), and the mixture boiled for three hours; 25 c.c. of nitric acid (sp. gr. 1.32—1.33) were then added, and, after heating for some time, a further 25 c.c., after which the boiling was continued for about half an hour. While the acid solution was being boiled, the flask was provided with a device by which the vapours were washed with water, the washings running into the flask. The solution was finally made up to 500 c.c., and 250 c.c. were titrated according to Volhard's method. In seven tests the amount of perchlorate found, varied from 0.398 to 0.410 grm.—A. S.

Sodium Hydrosulphite; Action of — upon Metallic Salts. O. Brunck. VII., page 1146.

Sulphur in Irons and Steels; New Method for the Determination of —. H. B. Pulsifer. Chem. News, 1904, 90, 230—231.

Two and a half grms. of the sample are moistened with water in a broad 250 c.c. beaker, and 20 c.c. of chloric acid (sp. gr. 1.12) and a very small quantity of hydrofluoric acid are added. After the action has subsided, 5 c.c. of strong hydrochloric acid are added, the beaker is covered with a watch-glass, and the contents are heated to boiling. The residue is filtered off with the aid of the filter-pump, washed two or three times with a little water, drained,

and fused with sodium peroxide in a nickel crucible. The melt, after cooling, is dissolved in water and hydrochloric acid, the solution filtered and the filtrate mixed with the main solution, which has, in the meantime, been treated with 20 c.c. of strong hydrochloric acid, and evaporated until its volume is less than 10 c.c., in order to expel the hydrofluoric acid. The volume of the mixed solutions should be about 100 c.c. The sulphur is now determined in the usual manner as barium sulphate. The method is stated to give accurate results, and it is much quicker than the usual processes, the time occupied from the weighing of the sample to the precipitation of the barium sulphate being only 20 minutes.—A. S.

Tin, Commercial, and its Alloys; Analysis of —. A. Hollard and L. Bertiaux. Bull. Soc. Chim., 1904, 31, 1128—1131.

THE following methods are recommended for the determination of impurities in tin and its alloys:—**Arsenic** is determined by the method previously described by the author (this J., 1900, 563). **Lead, bismuth, and iron.**—The tin is dissolved in a mixture of hydrochloric acid and an extremely small quantity of nitric acid; excess of ammonia is added, and sulphuretted hydrogen is passed through the solution until all the tin sulphide has dissolved. The precipitate is dissolved in hot hydrochloric acid containing bromine, the excess of which is then removed by boiling; the bismuth, lead, and copper are precipitated as sulphides and the iron determined in the solution volumetrically. The precipitate of sulphides is again dissolved in hydrochloric acid containing bromine, excess of ammonia and a small quantity of potassium cyanide are added, and the lead and bismuth are precipitated as sulphides. The washed precipitate is oxidised to sulphate, and the lead and bismuth determined electrolytically (this J., 1904, 207 and 839). **Antimony** is determined by dissolving the tin in *aqua regia*, evaporating to dryness repeatedly with hydrochloric acid to remove all nitric acid, adding a little sodium carbonate to render the residue alkaline, dissolving in sodium hydroxide and potassium cyanide and electrolysis. **Copper and sulphur.**—The tin (5 grms.) is attacked with nitric acid, and the resulting liquid, &c., evaporated to dryness on the water-bath. The residue is treated with water acidified with nitric acid and washed on a filter; copper is determined by electrolysis the filtrate, the residual solution being precipitated with barium chloride solution. **Alloys of lead and tin** are preferably mixed with 10 times their weight of copper, and treated with dilute nitric acid, the lead being determined in the solution by electrolytic deposition, as peroxide, after the stannic oxide precipitate has been removed.—T. F. B.

Lead, Commercial [Electrolytic Determination of Impurities in —]. A. Hollard and L. Bertiaux. Bull. Soc. Chim., 1904, 31, 1124—1128.

THE lead is dissolved in nitric acid and deposited on a platinum anode by using a current of about 0.2 ampere. Sulphuric acid is added to the residual solution, which is then evaporated and diluted; nitric acid is added and any remaining lead is filtered off as sulphate. The copper is determined in this solution by electrolysis. **Nickel, zinc, and iron** are determined by the method previously described (see this J., 1904, 768). **Sulphur** is determined by evaporating the solution, freed from lead as above, to dryness with hydrochloric acid, dissolving the residue in dilute hydrochloric acid, and precipitating with barium chloride. For the determination of **arsenic**, the lead is heated with sulphuric acid, and the solution distilled with ferrous sulphate and hydrochloric acid (see this J., 1901, 563). Zinc chloride is added to the residue from this distillation, and the mixture is distilled in a current of hydrochloric acid gas, antimony chloride passing over. The distillate is neutralised with ammonia, and the antimony precipitated by means of sulphuretted hydrogen. The precipitate is dissolved in a solution of sodium hydrosulphide and potassium cyanide (see this J., 1903, 512) and the **antimony** determined by electrolysis, using a current of 0.1 ampere. **Silver** is determined by precipitating a nitric acid solution of the lead by hydrochloric acid, dissolving the precipitate in potassium

cyanide solution and electrolysis with a current of 0.1 ampère. The deposited metal is dissolved in nitric acid and the silver determined volumetrically by the thiocyanate method. **Bismuth and tin.**—A solution of lead in dilute nitric acid is evaporated to dryness, and the residue mixed with water and evaporated again. Ammonium nitrate solution is added and the mixture filtered; the residue on the filter, which contains the bismuth, tin, arsenic, and antimony, is dissolved in hydrochloric acid, and precipitated by sulphuretted hydrogen; the arsenious sulphide is removed from the precipitate by treatment with ammonium carbonate solution, and the antimony and tin sulphides by ammonium sulphide; the residue is now oxidised to convert sulphide into sulphate, the bismuth being determined electrolytically (see this J., 1904, 839). The ammonium sulphide solution, containing the tin and antimony, is precipitated by means of hydrochloric acid, the precipitate dissolved in sodium hydrosulphide and potassium cyanide, the antimony being removed as above. The tin is precipitated from the solution by hydrochloric acid, the precipitate dissolved in alkali sulphide and the solution evaporated to dryness; the residue is oxidised by means of potassium chlorate, hydrochloric acid added, and the solution filtered, ammonium oxalate being then added to the filtrate and the tin determined by electrolysis of the hot solution, using a current of about 1 ampère.—T. F. B.

ORGANIC—QUALITATIVE.

Cotton-Seed Oil; Detection of — in Olive Oil. E. Milliau. *Comptes rend.*, 1904, 139, 807—809.

THE adulteration of olive oil by cotton-seed oil is generally detected by the reduction of silver nitrate on warming in alcoholic solution, or else by Halphen's reagent [mixture of amylic alcohol and carbon bisulphide containing sulphur]. Since, however, kapok oil and baobab oil [*Baobab tree: Adansonia digitata*] also show both these reactions for cotton-seed oil, and since kapok oil is now a commercial product, it was necessary to distinguish between these two oils and cotton-seed oil. The author proposes the following simple method:—The fatty acids of the oil are prepared, washed, and dried; 5 c.c. of the fused acids are mixed in a test-tube with 5 c.c. of a 1 per cent. solution of silver nitrate in absolute alcohol: the mixture is shaken, and the reaction observed. The presence of even 1 per cent. of kapok oil produces a dark brown coloration after about 20 minutes, at the ordinary temperature, baobab oil behaves in an exactly similar manner, whereas cotton-seed oil causes no reduction until the mixture is warmed.

—J. F. B.

Cholesterol; New Reaction of —. C. Neuberg and D. Rauchwerger. *Fest-schr. für E. Salkowski*, 1904, 279—285. *Chem. Centr.*, 1904, 2, 1434—1435.

THE tests known at present for cholesterol are given by phytosterol, coprosterol and hippocoprosterol as well as by the typical cholesterol from gall-stones. With a mixture of 3-methylfurfural (or rhamnose) and concentrated sulphuric acid, however, the typical cholesterol gives a characteristic coloration. A very small quantity of cholesterol is warmed with about 1.5 c.c. of absolute alcohol and a trace of rhamnose added. After cooling, an equal volume of concentrated sulphuric acid is introduced so as to form a layer below the solution, whereupon a raspberry-coloured ring is produced almost instantaneously at the zone of contact of the two liquids. If the layers be now mixed while the tube is cooled by a current of cold water, the mixture becomes intensely coloured, and when diluted with alcohol, gives a characteristic dark absorption band in the green to blue region of the spectrum, between the lines E and B. If the liquid becomes warm, it acquires a brownish instead of a raspberry colour, and then gives a second absorption band near the line D. Amyl or methyl alcohol, acetone or glacial acetic acid may be used in place of ethyl alcohol. With phytosterol the reaction fails, or at most, a pink coloration is produced, with occasionally an absorption band in the yellow to green portion of the spectrum. Similar reactions are given by various hydro-aromatic compounds, among them, abietic acid and retenedodecahydride, $C_{18}H_{20}$ (compare this J., 1904, 1117).—A. S.

Morphine; Contributions to the Knowledge of Alkaloid Reactions. IV. — C. Reichard. *Chem.-Zeit.*, 1904, 28, 1102—1105. (See this J., 1904, 458 and 1116.)

MORPHINE when added in small quantities to a solution of arsenious or arsenic acid with sulphuric acid, produces a fine purple-red coloration. The colour changes to violet after 3—5 days. The colouring matter is not extracted by ether. Atropine can be detected in the presence of morphine by the production of a fragrant odour. Strychnine with these reagents gives a dirty yellowish-green coloration; with brucine the liquid turns black on warming; cocaine produces a black precipitate. Morphine sulphate added to a concentrated solution of antimony trichloride give a deep red coloration on warming. Added to stannous chloride solution it produces no change, even on warming, till sulphuric acid is added, when a fine violet-purple coloration is produced. With atropine there is no change. When morphine is warmed with bismuth chloride solution a yellow coloration is formed. Brucine interferes with this reaction, but atropine, strychnine and cocaine do not. Morphine added to a solution of cobalt nitrate and sulphuric acid yields a dark red colour slowly changing to brownish-yellow; brucine interferes with this reaction. If cerium dioxide is triturated with sulphuric acid, morphine added, and the mixture warmed, a strong bluish-violet colour appears. It is not advisable to make use of this reaction in the presence of strychnine, or brucine, either of which gives a strong yellowish-red coloration; but it may be used in the presence of cocaine or atropine.

—F. S.

ORGANIC—QUANTITATIVE.

Dégrads; Note on the Analysis of —. G. Baldracco. *Collegium*, 1904, 333—335.

THERE are two well-known methods for determining the unsaponifiable matter:—(1) Methods by which the grease is saponified and the unsaponified matters dissolved out from the solution of the soap by extraction with ether or petroleum spirit; (2) Methods by which the unsaponifiable matter is extracted from the dry soap. The author has compared these two methods for dégrad, and finds that they always yield different results. The second method of the two, is the more accurate one.—F. D. T.

India-Rubber Articles; Analysis of —. W. Esch and A. Chwolle. *Gummi-Zeit.*, 1904, 19, 125—126. (This J. 1893, 467; 1894, 986—988 and 476.)

VARIOUS modifications of Henriques' and Weber's methods for the analysis of rubber goods have recently been proposed. Chéneau (this J., 1900, 780) suggests the extraction of paraffin with light petroleum spirit or chloroform, after extractions with alcoholic soda, acetone, and cold nitrobenzene. The authors have satisfied themselves that paraffin is completely extracted by acetone if the samples are properly prepared (fine enough) and extracted for a sufficiently long time. Chéneau's unsatisfactory results with acetone were doubtless due to the samples not being rolled sufficiently thin. Pontio makes his first extraction with alcohol instead of acetone. There appears to be no advantage if asphaltum be present; as both solvents dissolve a small quantity (in the case of Syrian asphaltum about 1.5 per cent.). Acetone also dissolves the unsaponifiable oils completely, but alcohol only partially. Pontio, therefore, extracts the unsaponifiable oils, together with the asphaltum, by means of a mixture of spike oil and acetone. It appears to be immaterial whether the unsaponifiable oils are extracted with the paraffin or with the asphaltum. An experiment showed that alcohol extracted five-sixths of the paraffin in a specially prepared sample (containing 21 per cent. of paraffin) in five hours, whilst acetone extracted the whole in three hours. Henriques and Weber used cold nitrobenzene for the extraction of asphaltum; Pontio uses a mixture of 60 parts of spike oil and 40 parts of acetone, boiling for six hours. The great difference between the boiling points of the two solvents and the tendency to dissolve vulcanised rubber makes this latter method impossible. Henriques, after extraction of the sample with alcoholic soda, cold ether or hot acetone, and cold nitrobenzene, ascertained the combined sulphur and mineral constituents in the insoluble

amide, and calculated from the difference the amount of rubber, with the aid of factors to correct for the loss of rubber due to small quantities dissolved by the various solvents used. This correction depends, of course, upon the solvents used, and the factor $\frac{100}{97.5}$ quoted by him as an example is not to be taken as a general factor, as assumed by some investigators. For the extraction of unsaponifiable oils from samples of rubber which could not be finely powdered or crushed, Henriques used ether, on account of its penetrative power being superior to that of acetone; however, apart from this, and in all other cases, acetone is much the better solvent.—J. K. B.

Reducing Sugars; Separation or Isolation of — by Means of Aromatic Hydrazines. F. Votoček and K. Vondráček. Ber., 1904, 37, 2854—2858.

Is the separation of reducing sugars from mixtures it is first ascertained by preliminary tests (colour reactions, distillation with hydrochloric acid, &c.) what types of sugar are present, i.e., whether they are hexoses, pentoses, methylpentoses, or mixtures of these). The content of reducing sugar in the syrup is then determined by Fehling's solution, and water added in such quantity that the proportion of sugar is about 5 per cent. This solution is then treated with an equivalent quantity of a suitable substituted hydrazine or its acetate, and the deposited hydrazone filtered off; to the mother liquor direct (i.e., without setting free the sugar by means of benzaldehyde or formaldehyde) another aromatic hydrazine is then added to convert the second sugar into either a hydrazone or osazone. This operation is repeated, should a third sugar be present. The method has been applied to various mixtures of pure sugars and also to the saccharine products of hydrolysis of arabinic acid (from sugar beets), gum arabic, and coffee beans.—T. H. P.

Codeine in Opium; Determination of —. C. E. Caspari. Pharm. Rev., 22, 348. J. Pharm. Chim., 1904, 20, 458—460.

Fifty grms. of opium are extracted with water, the aqueous liquid is evaporated to 250 c.c., 5 grms. of barium acetate are added, and the solution is made up to 700 c.c. with water. The meconic acid and resinous substances which are precipitated, are filtered off and washed with cold water, and the filtrate and washings are concentrated, treated with a further 5 grms. of barium acetate, diluted and filtered. These operations are repeated until barium acetate produces no further precipitate. The solution is then concentrated, a slight excess of a 10 per cent. solution of sodium carbonate is added, and the solution is filtered. The precipitate which contains the thebaine, papaverine, and narcotine is filtered off and washed with water, and the filtrate and washings are acidulated with dilute hydrochloric acid, and concentrated by evaporation. The greater part of the morphine is precipitated by adding excess of a 2 per cent. solution of ammonia, filtered off, and washed. The filtrate is acidulated, concentrated, and again treated with ammonia to precipitate the remainder of the morphine, which is filtered off and washed. The filtrate is acidulated, concentrated to 70 c.c., rendered alkaline with weak ammonia, and shaken with benzene, which dissolves the codeine, but not the narcotine. In the evaporation residue of the benzene extract, the codeine is determined by titration. By this method Smyrna opium was found to contain, in two tests, 1.12 and 1.33 per cent. respectively of codeine, $C_{17}H_{21}NO_3 \cdot H_2O$.—A. S.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Radio-active Gas in the Hot Springs of Wiesbaden; Presence of a —. F. Henrich. Z. angew. Chem., 1904, 17, 1757—1760.

The author finds that the gas and water from the hot springs of Wiesbaden are distinctly radio-active. The stalactites present in the springs are also radio-active, and, unlike the water and gas, do not become inactive on keeping, although fresh stalactites are more active than those which have been removed for some time. It is

possible to make the water nearly inactive by freeing it from dissolved gases by boiling.—A. S.

Carbon Dioxide; Decomposition of — by Light. A. Bach. Ber., 1904, 37, 3945—3946.

The author found, some years ago, that when carbon dioxide was bubbled through uranium acetate solution in bright sunlight, reduction occurred, whilst no reduction was effected by exposure of the uranium solution alone to sunlight, or by bubbling carbon dioxide through it in the dark. Euler has stated that uranium acetate solution is reduced by sunlight, either alone or when nitrogen is bubbled through it. The author, however, confirms his original observation, and attributes the difference between Euler and himself to impurity in one or the other uranium solution.—J. T. D.

Aurous Iodide; Preparation of — by the Action of Iodine on Gold. F. Meyer. Comptes rend., 1904, 139, 733—736.

At the ordinary temperature, iodine is without action on gold; and aurous iodide, on the other hand, does not dissociate even in a vacuum. Between 50° C. and its melting point, pure dry iodine reacts on gold, forming amorphous aurous iodide; and above the melting-point of iodine the crystallised iodide is produced. The direct reaction is always limited by the inverse one, but by using a sufficient excess of iodine a given quantity of gold can be completely converted into iodide. The iodide is best separated from the excess of iodine by careful sublimation of the latter at 30° C., as most solvents of iodine decompose the iodide. The formation of iodide takes place, in closed vessels, in presence of water; but the reaction is limited, and in the open air, where iodine can escape, water completely decomposes aurous iodide.—J. T. D.

Fluorides of Boron and Silicon; Preparation and Physical Constants of —. H. Moissan. Comptes rend., 1904, 139, 711—714.

The substances formed by the direct reaction of fluorine on boron and on silicon were proved to be identical respectively with boron trifluoride and silicon tetrafluoride, prepared by the usual methods. The melting and boiling-points of boron trifluoride were determined and found to be -127° and -101° C. respectively, under atmospheric pressure. Silicon tetrafluoride is solid at -97° C., under atmospheric pressure, and at that temperature volatilises rapidly without liquefying. (Olszewsky had already recorded a similar behaviour at -102° C.) Under two atmospheres pressure it melts at -77° C. to a transparent and exceedingly mobile liquid, which boils at -65° C. when the pressure is 181 cm. of mercury. The critical point of silicon tetrafluoride is -1.5° C., and the critical pressure 50 atmospheres.—J. T. D.

Hydrogen Peroxide; Effect of "Poisons" on Decomposition of — by Hemase. G. Senter. Proc. Roy. Soc., 1904, 74, 201—217.

QUANTITATIVE measurements have been made of the effects of various substances on the rate of decomposition of hydrogen peroxide by hemase, an enzyme obtained from blood. The probable mechanism of the catalysis is discussed, and reasons are given for supposing that what is actually measured is "the rate of diffusion of hydrogen peroxide to the enzyme." The author prefers a chemical explanation of the action of these poisons to those already advanced. From the results obtained with acids and alkalis, as well as from the results of other observers, it is concluded that at least some enzymes are amphoteric substances, i.e., substances which are neutral in aqueous solution, but can combine with either acids or alkalis to form salts.—T. H. P.

Formaldehyde; Formation of — during the Combustion of Tobacco. A. Trillat. Comptes rend., 1904, 139, 742—744.

CIGARS, cigarettes, and tobacco in wooden and clay pipes were burnt, and the products of combustion examined for formaldehyde (compare this J., 1904, 744). Amounts varying from 0.05 to 0.12 per cent. of the weight of the

tobacco were found. The amount varies but little with the origin of the tobacco; that formed with a clay pipe is, as a rule, greater than that with a wooden pipe or from cigars or cigarettes—possibly owing to catalytic action of the hot clay surfaces. The formaldehyde seems to exist, not in the free state, but in combination with nicotine and other bases formed at the same time. The physiological effects of the aldehyde are no doubt modified on this account.

—J. T. D.

Rhodoese and Fucose; Enantiomorphism of —.

E. Votoček. Ber., 1904, 37, 3859—3862.

THE author has expressed the view (Ber., 1904, 37, 806) that the sugar rhodoese, obtained by the hydrolysis of the glucoside convolvulin, and fucose, isolated by Tollens from plants of the *Fucus* species and also from tragacanth, are enantiomorphously related methylpentoses. Since then, Tullens has found that the melting point of fucosephenylosazone is 158°—159° C., whilst that of rhodoesephenylosazone is 176°—177° C. The author now shows that the former of these melting points is incorrect, fucosephenylosazone melting at practically the same temperature as the rhodoese derivative, namely, 178°. The two phenylhydrazides of the monocarboxylic acids of rhodoese and fucose also have identical melting points. A mixture of equal amounts of the two sugars forms a true racemic compound, which is optically inactive, melts at 161°, and has a solubility in water less in the proportion of 1:5.4 than that of either of the components. This is the first known example of the natural occurrence of two enantiomorphously-related sugars. The view that nature only produces one member of an enantiomorphous pair of sugars is hence erroneous. The author shows that rhodoese really exists as such in convolvulin, and is not produced by the action of the baryta used for the hydrolysis.—T. H. P.

Isomeric Glucosides and Galactosides; Hydrolysis of — by Acids and Enzymes. E. F. Armstrong. Proc. Roy. Soc., 1904, 74, 188—194.

THE suggestion, put forward by Bourquelot and Herissey, that the action of emulsin on milk sugar is due to the presence of small quantities of lactase, together with the emulsin proper, is improbable owing to the facts:—(1) That the curve expressing the rate at which milk sugar changes is not of the form to be expected if only a very small quantity of enzyme (lactase) were present, as then a linear expression should apply during the early stages; actually the curve is only of this form when small quantities of emulsin are used. (2) The action of emulsin on milk sugar is most retarded by dextrose and only to a slight extent by galactose, whereas the latter alone affects the action of lactase. (3) The curves for emulsin fall off very much more rapidly than those for lactase, showing that the action of the products in removing the enzyme is greater in the former case. It would seem, therefore, that emulsin is capable of acting on β -galactosides, as well as β -glucosides. With the α - and β -glucosides and the α - and β -galactosides, where the stereo-isomerism in each pair of compounds is confined to the terminal carbon atom, the β -compounds undergo hydrolysis by acids much more readily than the corresponding α -compounds. Further, on passing from a glucoside to the corresponding galactoside—involving a change in the general configuration at the fourth carbon atom affecting only the nature of the attachment of the oxygen atoms within the ring—a marked influence is exerted on the activity of the group associated with the terminal carbon atom, the galactoside being far more readily hydrolysable than the glucoside. Maltose is hydrolysed more rapidly by yeast extract than α -methylglucoside, and, in both cases, the velocity coefficient of the change diminishes as action proceeds, but to a far greater extent with maltose; the value of K for the latter is about six times as great as that for the glucoside. The hydrolysing activity of the enzyme is much greater than that of acids.—T. H. P.

Sucroclastic [Hydrolytic] Actions of Acids and Enzymes; Contrast between the —. E. F. Armstrong and R. J. Caldwell. Proc. Roy. Soc., 1904, 74, 195—201.

THE authors have determined the effects produced on the value of the velocity constant of the hydrolysis of cane-

sugar by hydrochloric acid by the addition of one or both of the products of hydrolysis or cane sugar itself. 100 c.c. of a 17.1 per cent. solution of cane-sugar, containing 0.5 grm.-molecule of hydrochloric acid were taken, and the following amounts of sugar added:—

Sugar added.	Mean Value of K.
9.0 grms. of glucose ...	12.53
9.0 " " levulose.....	12.30
9.0 " " invert sugar	12.42
8.35 " " cane sugar	12.55

It will be seen that about the same increase in the value of K (the velocity constant) is produced by equimolecular proportions of glucose and levulose, whilst the molecular effect of the biase cane sugar is about twice the molecular effect of the monose. The acceleration brought about by the addition of sugars may be attributed to a withdrawal of water by the sugar and the consequent increase in the amount of the "active system."—T. H. P.

New Books.

OILS AND FATS: THEIR USES AND APPLICATIONS. Cantor Lectures. Dr. J. LEWKOWITZCH, M.A., &c. William Trowce, 10, Gough Square, Fleet Street, London, E.C. 1904. Price 1s.

THE author's four Cantor Lectures are embodied in this pamphlet, which contains 52 pages, with 28 illustrations and 18 tables. The matter is subdivided and classified as follows:—I. Extent of the Oil and Fat Industries. Sources of Supply. Raw Materials and Modern Methods of Manufacture. II. Methods of Refining. Industry of Edible Oils and Fats. III. Burning Oils. Paint Oils, Lubricating, Blown, and Boiled Oils. Linoleum Industry. Turkey-Red Oils. Hydrolysis of Fats. IV. Saponification Processes. Candle Industry. Soap Industry. Glycerin, and its Recovery from Soap Lyes. (See also this J., 1904, 1098.)

APPLICATION OF SOME GENERAL REACTIONS TO INVESTIGATIONS IN ORGANIC CHEMISTRY. By Dr. LASSAR-COHN, Professor of Organic Chemistry at the University of Königsberg. Translated by J. BISHOP TINGLE, Ph.D. First Edition. John Wiley and Sons, New York. Chapman and Hall, Ltd., London. 1904. Price 4s. 6d.

12mo volume, containing translator's and author's prefaces, and 95 pages of subject matter, also an alphabetical index. The purpose of the book is to discuss, in a systematic and generalised manner, the application of certain reactions and methods to investigations in Organic Chemistry. The divisions of the subject indicate generally the method adopted. I. Fixation of labile Hydrogen Atoms. II. Modification of Reactions. III. Improvement in the Conditions of Reaction. Overstrain of Reactions. IV. Influence of neighbouring Atoms and Atomic Complexes.

CHEMISCH-TECHNISCHE UNTERSUCHUNGSMETHODEN. Mit Benutzung der früheren von Dr. Friedrich Böckmann bearbeiteten Auflagen, und unter Mitwirkung von H. Adam, F. Barnstein, Th. Beckert, O. Böttcher, C. Cunceler, K. Dieterich, K. Dümmler, A. Ebertz, C. v. Eckenbrecher, F. Fischer, F. Frank, H. Freudenberg, E. Gildemeister, R. Gnehm, O. Guttman, E. H. Hoff, W. Herzberg, D. Holde, W. Jettel, H. Köhler, Ph. Kreiling, K. B. Lehmann, J. Lewkowitsch, C. J. Lintner, E. O. v. Lippmann, E. Marckwald, J. Messner, J. Passler, O. Pfeiffer, O. Pufahl, H. Rasch, O. Schluttig, C. Schoch, G. Schüle, L. Tietjens, K. Windisch, L. W. Winkler. Herausgegeben von Dr. GEORG LUNGE, Professor der technischen Chemie am eidgenössischen Polytechnikum in Zürich. Zweiter Band. 5te, vollständig umgearbeitete und vermehrte Auflage. Julius Springer's Verlag, Berlin. 1905. Price M. 16; bound, M. 18.

LARGE 8vo volume, containing 842 pages of subject-matter, with 153 illustrations, and an appendix with eight

pages of tables. The subject matter treated of in this second volume is as follows:—I. IRON (Th. Beckert): (i) Analysis of the Ores. (ii) Analysis of Iron. II. METALS OTHER THAN IRON (O. Pufahl): (i) Silver. (ii) Gold. (iii) Platinum. (iv) Mercury. (v) Copper. (vi) Lead. (vii) Bismuth. (viii) Tin. (ix) Arsenic. (x) Antimony. (xi) Zinc. (xii) Cadmium. (xiii) Nickel and Cobalt. (xiv) Manganese. (xv) Chromium. (xvi) Tungsten. (xvii) Uranium. (xviii) Molybdenum. (xix) Aluminium. (xx) Thorium. (xxi) Metallic Salts. III. ARTIFICIAL MANURES (O. Böttcher): (i) General Methods of Examining Artificial Manures. (ii) Special Methods for Examining Individual Manures. (iii) Methods for Examining Products and Raw Materials of the Manufacture of Manures in International Commerce. IV. FEEDING STUFFS (F. Barnstein). V. EXPLOSIVES (Oscar Guttmann): A. Raw Materials. B. Explosives. C. Tests of Stability and Thermal Effect. VI. DETONATORS (Wladimir Jettel): A. Raw Materials. B. Matches. VII. GAS MANUFACTURE. AMMONIA (Otto Pfeiffer). VIII. CALCIUM CARBIDE AND ACETYLENE (G. Lange): A. Raw Materials. B. Calcium Carbide as a Trade Product. C. Acetylene. IX. COAL-TAR INDUSTRY (H. Köhler): (i) Properties and Composition of Coal-tar. (ii) Investigation of Coal-tar. (iii) Practical Process and Control. (iv) Final Products. X. INORGANIC COLOURING MATTERS (R. Gnehm): (i) Blue Colours. (ii) Yellow Colours. (iii) Green Colours. (iv) Red Colours. (v) Brown Colours. (vi) Black Colours. (vii) White Colours. (viii) Bronze Colours. (ix) Colour Lakes from Artificial Colours. (x) Ultramarine.

DIE FABRIKATION DER SODA NACH DEM AMMONIAKVERFAHREN. Von H. SCHREIB. Julius Springer's Verlag, Berlin. 1905. Price M. 9.

8vo volume, containing 312 pages of subject-matter, and a series of three tables, filled with plans of apparatus and plant relating to the Ammonia-Soda Industry. The text is classified on the following lines:—I. Introduction: Development of the Ammonia-Soda Industry. II. Burning the Lime and Recovering the Carbon Dioxide liberated. III. Preparing the Ammoniacal Solution of Common Salt. IV. Precipitation of the Sodium Bicarbonate. V. Separating the Sodium Bicarbonate from the Mother Liquors, or Filtration. VI. Decomposing the Sodium Bicarbonate into Sodium Carbonate and Carbon Dioxide, or Calcining. VII. Regenerating or Distilling the Ammonia. VIII. Treatment and Utilisation of the Spent Liquors. IX. Calculating the Power required for the Manufacture of Ammonia-Soda. X. Materials required and Costs of Preparation of the Ammonia-Soda. XI. Review of Manufacturing Method, &c.

DIE DARSTELLUNG DES ZINKS AUF ELEKTROLYTISCHEM WEGE. Von Dr. ing. EMIL GÜNTHER. Wilhelm Knapp's Verlag, Halle a. S. 1904. Price M. 10.

THIS forms one of a series of monographs on applied electricity, and takes the form of an 8vo volume, containing dedication, preface, 241 pages of subject-matter, with 59 illustrations, and an alphabetical index of names and subjects. The matter is classified as follows:—I. Properties of Zinc. Production. Uses. Occurrence. Extraction by Metallurgical Methods. Review of Extraction by Electrochemical Methods. II. Electrolysis of Aqueous Solutions. Obtaining Zinc from Mixed Ores. Obtaining Zinc Chloride. The Hoepfner Process. III. Electrolysis of fused Zinc Salts. Appendix. Calculation and Comparison of Costs.

Trade Report.

I.—GENERAL.

THE PATENT RULES, 1905.

Statutory Rules and Orders, 1904. No. 1652. Dated Oct. 20, 1904.

By virtue of the provisions of the Patents, Designs, and Trade Marks Acts, 1883 to 1902, the Board of Trade do hereby make the following rules:—

Short Title.

1. These rules may be cited as the Patents Rules, 1905.

Commencement

2. These rules shall come into operation from and immediately after the 31st day of December, 1904.

Interpretation.

3. In the construction of these rules, any words herein used defined by the said Acts, shall have the meanings thereby assigned to them respectively.

Applications for Patents.

4. The statement of the invention claimed, with which a complete specification must end, shall be clear and succinct as well as separate and distinct from the body of the specification.

5. For Rule 9 of the Patents Rules, 1903, the following rule shall be substituted:—

When a specification comprises several distinct matters, they shall not be deemed to constitute one invention by reason only that they are all applicable to or may form parts of an existing machine, apparatus, or process.

Where a person making application for a patent has included in his specification more than one invention, the Comptroller may require or allow him to amend such application and specification and drawings or any of them so as to apply to one invention only, and the applicant may make application for a separate patent for any invention excluded by such amendment.

Every such last-mentioned application may, if the Comptroller at any time so direct, bear the date of the original application, or such date between the date of the original application and the date of the application in question, as the Comptroller may direct, and shall otherwise be proceeded with as a substantive application in the manner prescribed by the said Acts and by any rules thereunder for the time being in force.

Where the Comptroller has required or allowed any application, specification, or drawings to be amended as aforesaid, such application shall, if the Comptroller at any time so direct, bear such date, subsequent to the original date of the application and not later than the date when the amendment was made, as the Comptroller shall consider reasonably necessary to give sufficient time for the subsequent procedure relating to such application.

Procedure under Section 1 of the Patents Act, 1902.

6. If after the leaving of any complete specification the examiner reports that the nature of the invention is not sufficiently disclosed and defined to enable him to make the investigation prescribed by subsection 1, and the Comptroller has required amendment of the specification and drawings, or either of them, the application shall, if the Comptroller at any time so direct, bear such date, subsequent to its original date and not later than the date when the requirement is complied with, as the Comptroller may consider reasonably necessary to give sufficient time for the subsequent procedure relating to such application.

7. When the Examiner in prosecution of the investigation prescribed by subsection 1, finds that the invention claimed in the specification under examination has been wholly claimed or described in one or more specifications within the meaning of the subsection in question,

he shall, without any further prosecution of the investigation, make a provisional report to that effect to the Comptroller.

If the provisional report of the Examiner made under this Rule be not revised or altered, it shall be deemed a final report, and the application shall be dealt with as provided by subsection 6. If, however, such provisional report be reversed or altered, the investigation prescribed by subsection 1 shall be continued, and a further report shall be made to the Comptroller, and the specification shall be dealt with as provided in subsection 5 or subsection 6, as the case may require.

8. The time within which an applicant may leave his amended specification under subsection 2 shall be two months from the date of the letter informing him that the invention claimed has been wholly or in part claimed or described in any specification or specifications within the meaning of subsection 1.

In any special case the Comptroller may, if he think fit, enlarge the time prescribed by this Rule.

9. When the applicant for a patent has been informed of the result of the investigation of the examiner, made under the provisions of subsection 1, and the time allowed by Rule 3 for amendment of his specification has expired, the Comptroller, if he is not satisfied that no objection exists to the specification on the ground that the invention claimed therein has been wholly or in part claimed or described in a previous specification within the meaning of that subsection, shall inform the applicant accordingly, and appoint a time for hearing him, and shall give him ten days' notice at the least of such appointment. The applicant shall, as soon as possible, notify the Comptroller whether or not he desires to be heard. The Comptroller shall, after hearing the applicant, or without a hearing, if the applicant has not attended a hearing appointed or has notified that he does not desire to be heard, determine whether reference ought to be made in the applicant's specification to any, and, if so, what, prior specification or specifications by way of notice to the public.

10. When under subsection 6 the Comptroller determines that a reference to a prior specification ought to be made by way of notice to the public, the form of reference shall be as follows, and shall be inserted after the claims:—

Reference has been directed in pursuance of section 1, subsection 6, of the Patents Act, 1902, to the following specification of Letters Patent No. , granted to

Where the reference is inserted as the result of a provisional report under Rule 7, a statement to that effect shall be added to the reference.

Appeal.

11. Every decision of the Comptroller under the foregoing Rules shall be subject to an appeal to the law officer.

Sealing of Patent and Payment of Fee.

12. If the applicant for a patent desires to have a patent sealed on his application, he must, on or before the last day on which a patent can lawfully be sealed, pay the prescribed sealing fee; and if such fee be not paid, no patent shall be sealed.

The prescribed sealing fee should be paid by leaving, at the Patent Office, Form X. in the Second Schedule to these Rules, duly stamped.

Fees.

13. To the fees specified in the First Schedule to the Patents Rules, 1903, shall be added the fee specified in the First Schedule hereto.

Forms.

14. To the forms contained in the Second Schedule to the Patents Rules, 1903, shall be added the Form X. contained in the Second Schedule hereto; and in the Form C, contained in the first-mentioned Schedule the following direction shall be added in a marginal note, namely:—"In the preparation of the claim or claims, careful attention should

be paid to the terms of Rule 4 of the Patents Rules, 1903. Any unnecessary multiplicity of claims or prolixity of language should be avoided."

Size, &c. of Documents.

15. For Rule 17 of the Patents Rules, 1903, the following Rule shall be substituted:—

All documents and copies of documents, except drawings, sent to or left at the Patent Office or otherwise furnished to the Comptroller or to the Board of Trade shall be written, type-written, lithographed, or printed in the English language (unless otherwise directed) in large and legible characters with deep permanent ink upon strong white paper, and, except in the case of statutory declarations and affidavits, on one side only, of a size of approximately 13 ins. by 8 ins., leaving a margin of at least one inch and a half on the left-hand part thereof, and the signatures thereto must be written in a large and legible hand. Duplicate documents shall at any time be left, if required by the Comptroller.

At the top of the first page of a specification a space of about 2 ins. should be left blank.

Drawings accompanying Specifications.

16. For Rules 18 to 24 of the Patents Rules, 1903, the following Rules shall be substituted:—

As the drawings are printed by a photolithographic process, the character of each original drawing must be brought as nearly as possible to a uniform standard of excellence, suited to the requirements of such process, and calculated to give the best results in the interests of inventors, of the Office, and of the public. The following requirements should, therefore, be strictly observed, as non-compliance therewith will be certain to cause delay in the progress of an application for a patent.

17. Drawings, when furnished, should accompany the provisional or complete specification to which they refer, except in the case provided for by Rule 24. No drawing or sketch such as would require the preparation for the printer of a special illustration for use in the letterpress of the specification when printed should appear in the specification itself.

18. Drawings may be made by hand or lithographed, printed, &c. They must be made on pure white, hot-pressed, roll-d, or calendered strong paper of smooth surface, good quality, and medium thickness without washes or colours, in such a way as to admit of being clearly reproduced on a reduced scale by photography. Mounted drawings must not be used.

19. Drawings must be on sheets which measure 13 ins. from top to bottom, and are either from 8 ins. to 8½ ins. or from 16 ins. to 16½ ins. wide, the narrower sheets being preferable.

If there are more figures than can be shown on one of the smaller sized sheets, two or more of these sheets should be used in preference to employing the larger size. When an exceptionally large drawing is required, it should be continued on subsequent sheets. There is no limit to the number of sheets that may be sent in, but no more sheets should be employed than are necessary, and the figures should be numbered consecutively throughout and without regard to the number of sheets. The figures should not be more numerous than is absolutely necessary. They should be separated by a sufficient space to keep them distinct.

20. Drawings must be prepared in accordance with the following requirements:—

(a) They must be executed with absolutely black ink.

(b) Each line must be firmly and evenly drawn, sharply defined, and of the same strength throughout.

(c) Section lines, lines for effect, and shading lines should be as few as possible, and must not be closely drawn.

(d) Shade lines must not contrast too much in thickness with the general lines of the drawing.

(e) Sections and shading should not be represented by solid black or washes.

(f) They should be on a scale sufficiently large to show the invention clearly, and only so much of the apparatus,

machine, &c., should appear as effects this purpose. If the scale is given, it should be drawn, and not denoted by words.

Reference letters and figures, and index numerals used in conjunction therewith, must be bold, distinct, and not less than one-eighth of an inch in height. The same letters should be used in different views of the same parts. Where the reference letters are shown outside the figure, they must be connected with the parts referred to by fine lines.

21. Drawings must bear the name of the applicant (and, in the case of drawings left with a complete specification after a provisional specification, the number and year of the application) in the left-hand top corner; the number of sheets of drawings sent, and the consecutive number of each sheet, in the right-hand top corner; and the signature of the applicant or his agent in the right-hand bottom corner. Neither the title of the invention nor any descriptive matter should appear on the drawings.

22. A facsimile or "true copy" of the original drawings must be filed at the same time as the original drawings, prepared strictly in accordance with the above rules, except that it may be on tracing cloth and the reference letters and figures should be in black-lead pencil.

The words "original" or "true copy" must in each case be marked at the right-hand top corner, under the numbering of the sheet.

23. Drawings must be delivered at the Patent Office so as to be free from folds, breaks, or creases, which would render them unsuitable for reproduction by photography.

24. If an applicant desires to adopt the drawings lodged with his provisional specification as the drawings for his complete specification, he should refer to them in the complete specification as those left with the provisional specification.

Dated the 20th day of October, 1904.

G. W. BALFOUR,
President of the Board of Trade.

The First Schedule.

FEE PAYABLE ON SEALING OF PATENT.

13a. On sealing of patent; in respect of each £ s. d.
application 1 0 0

G. W. BALFOUR,
President of the Board of Trade.

20th October 1904.

The Second Schedule prescribes the Form of Notice of Desire to have Patent Sealed. (Form X.)

GREECE; TRADE OF —.

Foreign Office Annual Series, No. 3803.

The following table gives the values, and, where obtainable, the quantities of certain Grecian imports and exports during the years 1902-3 :—

Articles.		Imports.				Exports.			
		1902.		1903.		1902.		1903.	
		Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Oil, olives, &c.	Cwts.	..	£ 49,308	235,389	117,989	..	£ 308,369	189,776	107,278
Dyes and tanning material.....	..	..	25,735	32,811	26,972	..	843	1,020	628
Coal.....	Tons	193,952	372,888	232,446	363,848	..	..	..	..
Ores and marbles, raw, including enery.....	..	..	237,046	27,833	213,175	..	750,387	523,715	738,634
Medicines, chemicals, &c.....	Cwts.	..	277,506	175,576	288,640	..	25,057	13,012	36,782
Hides and bones, manufactured.....	..	..	51,466	2,992	43,408	..	13,087	1,028	13,092
Sugar, &c.....	..	..	123,448	162,046	114,874	..	33,880	4,321	16,486
Wine and spirituous liquors.....	Galls.	104,313	20,138	124,951	17,417	4,339,403	211,365	10,435,819	159,459
Crockery and glass.....	Cwts.	58,138	63,479	61,334	75,902	..	1,914	1,445	1,176
Ores and marbles, manufactured (in- cluding gold and silver).....	Tons	..	297,738	..	293,382	..	69,587	..	51,959
Paper, printed paper, &c.....	Cwts.	..	109,238	70,445	126,008	..	953	123	1,104

III.—TAR PRODUCTS, PETROLEUM, Etc.

OIL FIELDS OF INDIA; DEVELOPMENT OF THE —.

U.S. Cons. Rep., No. 2104, Nov. 10, 1904.

During the fiscal year ended March 31, 1904, the importation of kerosene oil into India fell off nearly 10,000,000 galls. During the preceding year there was an almost identical decline, so that, compared with the fiscal year 1901-2, the reduction was nearly 20,000,000 galls., equal to 21.7 per cent. The decline in the import of Russian oil was 19.4 per cent. and of American oil 27 per cent. The rapid development of the Indian oil fields has caused this decreased import. The Indian oil is not yet of as good quality as most of the imported oil, but its cheapness secures it a market. American oil, it is said, has security for a limited market in its superior quality, but keen competition among all the common grades seems assured.

PETROLEUM PRODUCTION; DECLINE IN RUSSIAN —.

Bd. of Trade J., Nov. 17, 1904.

The production of petroleum in Russia has diminished from 85 million barrels in 1901 to 75 million barrels in 1903. In 1902 Russia's share in the world's production was 43.5 per cent., and in 1903, 38.7 per cent. This decline is attributed to the lack of proper organisation, and to the frequent and disastrous fires at Baku.

VII.—ACIDS, ALKALIS, Etc.

SODIUM NITRATE; REASONS FOR ADVANCED PRICES OF —.

Montgomery and Co., London.

The following reasons are given for the continued advance in price of sodium nitrate :—(1) Partial failure of the sugar-beet crop on the Continent, causing a considerable rise in price of sugar. (2) Decreased shipments of nitrate from Chili during the last two months; these are not in keeping with the quantity permitted by the combination agreement, whence it is feared that the maximum quotas will not be nearly reached, which would probably result in a scarcity during the coming agricultural season.

BAUXITE IN THE UNITED STATES.

Eng. and Mining J., Nov. 10, 1904.

According to the Geological Survey, the quantity of bauxite produced in the United States last year was 48,087 long tons, an increase of 18,865 tons over the previous year. During the year the Pittsburgh Reduction Company completed its mining plant at Bauxite, Ark., and a refining plant at East St. Louis. At the present time, Georgia, Alabama, and Arkansas, in the order of their outputs, furnish the total supply of bauxite in the United States. The mineral occurs in other States, notably North Carolina and South Carolina, but the deposits are not of sufficient extent or purity to be of commercial value.

SULPHUR COMBINATION; PROGRESS OF THE ANGLO-SICILIAN —.

Eng. and Mining J., Nov. 10, 1904.

In 1897, the first fiscal year of the sulphur combination, exports from Sicily showed an increase of over 16 per cent., resulting in a net profit of 49,350*l.*, or about 6*s.* per ton on the business done by the Anglo-Sicilian Company. Three years later, in 1900, when the high record in exports was established at 557,668 tons, the profits of the company were more than doubled. In the fiscal year ended July 31, 1904, the net profits were the largest yet, amounting to 158,430*l.* From profits earned during the eight years from 1897 to 1904 inclusive, the company paid annually a regular dividend of 6 per cent. on its 700,000*l.* preferred stock, and sometimes made an extra distribution; and in 1903 and 1904 declared a total of 100 per cent. on the 85,000*l.* common stock. At the same time there was accumulated 397,680*l.* in reserve funds, of which 144,900*l.* is held against any depreciation of stocks of sulphur, an amount equivalent to 9*s.* 10*d.* per ton on the 293,188 tons at the seaports in Sicily on July 31, 1904.

In the eight years under review the exports from Sicily to the United States aggregated 1,122,241 tons, which constituted about one-third of the total exported to all countries. These imports, duty free, supplied about 36 per cent. of the consumption in America in the form of brimstone or sulphur recovered from pyrites.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

STONE INDUSTRY OF THE UNITED STATES.

Bd. of Trade J., Nov. 24, 1904.

The figures collected by the Geological Survey put the value of the stone quarried in the United States in 1903 at 73,384,200 *dols.*, an increase of 3,533,649 *dols.* over 1903, in spite of troubles in the building trades. The values of the output of the different kinds of stone are as follows:—

	1902.	1903.
	Dollars.	Dollars.
Granite.....	16,076,787	15,703,793
Trap rock.....	2,181,137	2,732,294
Sandstone.....	9,437,046	9,453,502
Blue stone.....	1,163,525	1,779,457
Marble.....	5,041,182	5,362,586
Limestone for building.....	24,959,731	26,042,651
" flux.....	5,271,252	5,423,732
Slate.....	5,899,051	6,250,855

Pennsylvania surpassed all other States in the product of its quarries during 1903. The value of its stone amounted to 13,913,220 *dols.* Second on the list is Vermont, with a value of 6,605,060 *dols.* New York is third, with a stone product valued at 5,742,833 *dols.*, and Ohio is fourth, with a product worth 5,114,051 *dols.* The production of every other State was considerably less.

X.—METALLURGY.

EGYPT; REVISED TARIFF VALUATION FOR METALS AND METAL MANUFACTURES.

Bd. of Trade J., Nov. 24, 1904.

According to the *Journal Officiel* of Nov. 2, the valuation tariff for metals and manufactures of metal has been revised. Copper, in all forms except wire, is rated at an increase of 2 millèmes* per kilo.; tin and zinc are also increased, the former 5 mill., the latter $\frac{1}{2}$ mill. per kilo. Manufactures of iron and steel are valued at slightly reduced rates in some cases, others remaining stationary. Other metals and manufactures are unaffected by this revision. The rate of duty remains at 8 per cent. *ad val.*

* 1000 millèmes = £E 1 = £1 0*s.* 6*d.*

PIG-IRON PRODUCTION OF RUSSIA. FIRST HALF OF 1903.

Bd. of Trade J., Nov. 24, 1904.

The following statistics of the production of pig-iron in Russia during the first six months of 1904 are taken from the *Messenger of Finance* (St. Petersburg) of the 24th October/6th November:—South Russia, 54,229,726 pounds; Ural, 21,844,248; Moscow District, 8,198,799; North Russia, 446,408; Poland, 10,948,498; Total, 90,157,674 pounds.

Comparative figures for the first six months of 1903 are not available, but the following statistics of the production of pig-iron during the past four years are published by the *Messenger*:—1900, 177,518,615 pounds; 1901, 172,778,274; 1902, 156,496,981; 1903, 149,154,927 pounds. The production for 1904 is estimated at 180,000,000 pounds. (Pound = 36 lb.)

PLATINUM; REDUCTION IN THE PRICE OF —.

Bd. of Trade J., Nov. 24, 1904.

The *Journal de St. Pétersbourg* states that, although the price of platinum is quoted at 14,500 roubles per pound, the actual price obtained for this metal by the mine owners in the Ural District is considerably less. One large proprietor sells platinum at 11,351 roubles per pound, while another has recently entered into a contract with an American firm for the sale of the whole output of the Taghilsk mines for the next ten years at rate of 10,000 roubles per pound, or about 29*l.* per lb.

XII.—FATS, FATTY OILS. Etc.

INSECT WHITE WAX; PRODUCTION OF — IN SZUCH'UAN, CHINA.

Bd. of Trade J., Nov. 17, 1904.

The annual production of insect white wax in Szuch'uan varies with the climatic conditions. Wind and rain are destructive to the insects. During the present year the rains have been exceptionally continuous and heavy; the estimated output of the Chia-ting Prefecture is 58,125 piculs. The price of each picul is T.45, so that the total value of the Chia-ting production is T.2,250,000. Ch'angtu is credited with an annual consumption of 1000 piculs. Other parts of Szuch'uan yield small quantities of white wax, but they are too insignificant to be of any commercial importance. The wax is mainly used in candle making and paper-glazing.

XIII. B.—RESINS, VARNISHES, Etc.

TURPENTINE IN INDIA.

Chem. and Druggist, Nov. 19, 1904.

The turpentine industry in India is confined to the pine forests of the Himalayas in the United Provinces (formerly called the North-West Provinces) and the Punjab. In the United Provinces the first distillery was erected in the Imperial Forest School, Dehra Dun, in 1881. The crude turpentine is collected from the Chir pine (*Pinus longifolia*) in Jaunsar and the leased forests of the Tehri-Garhwal, chiefly at Daragadh, Ninur, Obra, Sangared, and the Mantar and Sunar working circles. The trees are tapped soon after the rains are over in October, and cuts or "blazes" are made in the stem, at the base of which pots are placed to catch the exuding resin. In the lower forests of Kumaon the oleoresin begins to flow in March, and as the warm weather advances the flow increases, the greatest amount being obtained in June. One disadvantage of the factory at Dehra Dun is that it is situated more than 100 miles away from the forests, and the oleoresin has to be brought partly by pack animals and partly by country carts. The cost of the crude resin is R. 1.1 to R. 1.11 per maund of 82.6 lb. The distillation is carried on during the greater part of the year, and five large copper stills are capable of treating 10 maunds per day. In 1900-01, 1701 maunds were distilled, in 1901-2 1628 maunds, and in 1902-3, 1602 maunds. The crude oleoresin yields from 72 to 77 per cent. of resin or colophony and from 14 to 18 per

cent. of turpentine oil. Until three years ago the works at Dehra Dun were running at a profit, but recently there has been a loss on account of the prices of colophony falling from Rs. 5.2 to Rs. 2.7 per maund, and the larger quantities placed on the local markets by the Forest Department in other districts. The Conservator in his report for 1902-3 reviews the financial results of the whole undertaking from the year 1888-9, when the work was started. The total receipts were Rs. 79,417; capital and working expenses, Rs. 81,033; value of buildings, apparatus, and stock in hand, Rs. 15,252, leaving a surplus of Rs. 18,636. In 1895 arrangements were made for the introduction of the turpentine industry in Naini Tal, where the proximity to the railway and the shorter distance the material would have to traverse were important considerations. In the report for 1900-1 the manufacture of turpentine and colophony was pronounced a success, the prices realised were equal to those obtained for the imported article, and no difficulty was experienced in disposing of the output. During the year 22,267 trees were tapped, yielding 1454 maunds of oleoresin, which is equal to about 5 lb. per tree. The output of the factory was 1685 galls. of turpentine and 817 maunds of colophony, and the profit of the year's working was Rs. 5765. The next year the manufacture was prosecuted with greater success. Improvements were made in the factory; 38,632 trees were tapped, affording 2711 maunds of oleoresin. The output was 2204 gals. of turpentine and 1084 maunds of colophony, and a substantial profit remained at the close of the year. During 1902-3, on account of the additional still and the larger demand for the products, the manufacture was more than doubled, 42,979 trees being tapped, yielding 2989 maunds of oleoresin. The profit at the end of the year was Rs. 4467. The results were considered most satisfactory, allowing, as they did, for the low market value of the colophony, which fell from Rs. 5 to Rs. 2.12. The third factory was established in 1899 in Nurpur, in the Kangra Division, Punjab. It is estimated that the possible yield of the resin in the Kangra forests within reach of the distillery is 10,000 maunds, which should produce 15,000 gals. of turpentine and 7500 maunds of colophony. Reductions on the freight for the oil and resin have been obtained, and it is hoped these concessions will enable the product to compete with the imported article as far as the seaports. The resin tapping and distillery operations have continued to be a success from the commencement, and economies have been practised in the extraction of the resin from the forests and the working of the distillery at Nurpur. The whole of the turpentine is readily disposed of, and over 3000 maunds of colophony are sold regularly to local merchants. Last year it was reported that a purchaser had been found for all the colophony made. The price obtained was considered low (Rs. 3.10 in Calcutta).

XVI.—SUGAR, STARCH, Etc.

SUGAR INDUSTRY OF GREECE.

Foreign Office Annual Series, No. 3302.

The cultivation of the sugar beet was started in Thessaly some 12 years ago, and is making headway against the difficulties which attend the introduction of a new and difficult industry.

On a property favourably situated as regards water supply on the edge of the Thessalian plain and under the Pindus mountain range, M. Zographos sows yearly 1,500 acres of beet. The land has been gradually brought into a constantly improving state of fertility, yielding at present 8,000 kilos. per acre. To convert the beets into sugar a large factory has been established, which produces sugar of a satisfactory quality, though not quite as white as that imported from abroad. This defect, however, it is hoped to remedy by improved machinery. The sugar finds a ready sale in the country at a price slightly below that of the imported article.

The amount produced last year was about 1,250,000 kilos. (about 2,750,000 lb.), and the enterprise paid its expenses for the first time. With the constantly increasing yield of beets per acre, as the fertility of the land increases, it is hoped to realise substantial profits.

With a perhaps erroneous idea of the profits realised from the undertaking, the Government proposed at the beginning of the year 1904 to impose an excise duty of 50 lepta per oke on home-produced sugar. In deference to well-founded representations the idea appears to have been dropped, at any rate for the present.

M. Zographos sometimes employs as many as 1,500 hands. The chief difficulties to be contended with consist in the frequently-prevailing drought, an evil which extensive irrigation does not altogether remedy, and in the difficulty of disposing to advantage of the by-products, since their conversion into alcohol is prohibited in the interests of the currant and grape producers, and there is little scope for their use as food for cattle, there being few cattle to feed or fatten.

GUM ARABIC FROM THE SUDAN, EGYPT.

U.S. Cons. Reps., Nos. 2102, Nov. 8, 1904.

The gum arabic trade of the Sudan shows an enormous increase during the last few months. In July, 1904, the exports were 2,318,778 pounds, valued at 23,396*l*. Of this amount, the United States took 3,531*l*. worth. The price of gum is very low, but is now advancing, having risen to 31 cents a pound.

There were exported from Egypt 4,160,100 pounds in 1899, 6,042,050 pounds in 1900, 16,987,550 pounds in 1901, 21,791,000 pounds in 1902, and 18,939,747 pounds in 1903.

All Sudanese products are under a great disadvantage from the present high freight charges in the Nile Valley. It is believed that the new railway from Berber to the Red Sea will materially reduce this expense. The gum from Senegal is admitted duty-free into France, since Senegal is a French colony.

Gum is gathered in the forests of the Sudan and is brought to Omdurman, opposite Khartoum, and is there packed, weighed, and forwarded to Cairo, or to one of the seaports. There are at present three grades of gum recognised by the Sudan government. The first is the "hashab genaine gedaref." This pays to the government a royalty of 13*s*. 2*d*. per 99.05 pounds. The second grade, the "gezira," pays 9*s*. 3*d*., and the third, the "tah," pays 5*s*. 2*d*. per 99.05 pounds. The first quality is soft and white in colour, and is valued in Europe at 10 to 12 per cent. more than the second grade, which is hard and reddish in colour. The gum of this second quality is packed in parcels of from 370 to 385 pounds, and is shipped in double sacks. The first grade, which is bought chiefly by chemists and druggists, is packed in wooden cases of 100 pounds each.

A very recent decree of the Sudanese government has fixed the highest duty which can be levied on gum at 20 per cent. *ad valorem*, but it has not yet arranged the sliding scale on the inferior qualities.

The trade in Egypt is chiefly in the hands of a few merchants of Cairo and Alexandria, who forward the gum to their agents in large consignments. These agents, as they sell the gum, forward the proceeds to their principals and retain a small commission of from 2 to 2½ per cent.

BET CROP AND ESTIMATED SUGAR PRODUCTION OF RUSSIA.

Bd. of Trade J., Nov. 17, 1904.

According to the latest reports, the beet crop of Russia up to the 16th October amounted to 4.8 million tons, which should produce 625,000 tons of sugar. As 76 sugar refineries have not sent in their reports, and according to the yield of the beet fields per acre a further crop of 1.5 million tons is counted on, the total production of sugar in Russia for next season is estimated at about 820,000 tons.

XVII.—BREWING, WINES, SPIRITS, Etc.

TARTARIC MATERIALS; EXPORTS OF — FROM ITALY.

Bd. of Trade J., Nov. 24, 1904.

The following statement shows the export of tartar materials from the Italian continent during the period 1st October 1903 to 30th September 1904.

To	Half-refined Argols.	Vinaccia Argols.	Crude Argols.	Wine Lees.	Total.
	Tons.	Tons.	Tons.	Tons.	Tons.
United Kingdom ..	186½	1,000	150	100	1,386½
Germany	319	..	182	135	636
France	187½	..	10	1,990	2,167½
United States ..	3½	804	2,462	100	3,459½
Austria and sundries	52	1,083½	312	1,385	2,830½
Total { Tons ..	688½	2,977½	3,116	3,708	10,470
Value £	40,100	157,800	152,700	85,800	436,400

Patent List.

N.B.—In these lists, [A.] means "Application for Patent," and [C.S.] "Complete Specification Accepted."

Where a Complete Specification accompanies an Application, an asterisk is affixed. The dates given are (i) in the case of Applications for Patents, the dates of application, and (ii) in the case of Complete Specifications Accepted, those of the Official Journals in which acceptances of the Complete Specifications are advertised.

Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, AND MACHINERY.

- [A.] 24,641. White, Cobbold, and McNeal. Slime and sediment extractors.* Nov. 14.
- " 24,670. Imray (Meister, Lucius und Brüning). Extraction of water or other liquid from mineral, vegetable, and animal substances. Nov. 14.
- " 24,686. Lillie. Evaporating apparatus.* Nov. 14.
- " 24,785. Wilton and Wilton. Furnaces. Nov. 15.
- " 24,826. Mavor. Means for heating chambers used in the process of manufacturing linoleum, coated fabrics, and the like, and in the construction of gas furnaces. Nov. 16.
- " 24,870. Southworth. Apparatus for condensing liquids especially adapted for removing the albuminous matter from serum, &c.* Nov. 16.
- " 24,908. Capell. Washing gases and apparatus therefor. Nov. 16.
- " 24,986. Sugg. Apparatus for pressing gas. Nov. 17.
- " 25,079. Kunick. See under XVIII. A.
- " 25,204. Macquisten. Method of separating solid particles from each other, and apparatus therefor. Nov. 19.
- " 25,213. Mathys (Gayley). Method of treating gases. Nov. 19.
- " 25,216. Mackenzie (Lloyd). Apparatus for making solutions.* Nov. 19.
- " 25,272. Dunton. Apparatus for circulating liquids in tanks. [U.S. Appl., Nov. 25. 1903.]* Nov. 21.
- " 25,310. Ruppel. Protected earthenware cooks for use with acids, lyes, and the like.* Nov. 21.
- " 25,414. Lang. See under VIII.
- " 25,507. Blundell. Furnaces. Nov. 23.
- " 25,601. Stavenhagen and Geiler. Process of and apparatus for manufacturing filter bodies. Nov. 24.
- [C.S.] 25,589 (1903). Sewell. Evaporating apparatus. Nov. 30.
- " 967 (1904). Murphy. Apparatus for indicating the temperature of kilns or other hot-air chambers used in drying hair and like material. Nov. 23.
- " 1144 (1904). Parkes. Process and apparatus for evaporating gelatinous and the like solutions. Nov. 30.

- [C.S.] 1694 (1904). Morgan Crucible Co., Ltd., and Fox. Muffles. Nov. 30.
- " 3490 (1904). Branson. Apparatus for measuring quantities of highly volatile liquids. Nov. 28.
- " 16,316 (1904). Hantke. Process and appliance for raising liquids by means of compressed air. Nov. 23.
- " 21,776 (1904). Dodge. Gas and air mixing apparatus. Nov. 23.
- " 22,469 (1904). Howl, Wood, and Wright. Forced draught furnaces and the like. Nov. 30.

II.—FUEL, GAS, AND LIGHT.

- [A.] 24,694. Nusch (Mortimer-Sterling). Incandescent light mantles.* Nov. 14.
- " 24,787. Spencer. Regenerative furnaces for gas retorts, &c. Nov. 15.
- " 24,826. Mavor. See under I.
- " 24,975. Bennet. See under XXIII.
- " 24,987. Newton (Bayer and Co.). Flash light. Nov. 17.
- " 25,404. Marconnet. Process of and apparatus for producing gas from pulverisable fuel. [Fr. Appl., Dec. 8, 1903.]* Nov. 22.
- " 25,527. Koppers. Coke furnaces.* Nov. 23.
- [C.S.] 25,698 (1903). Ladd. Bodies adapted for lighting purposes and rendered incandescent by heat or electricity. Nov. 23.
- " 27,496 (1903). Mond. Gas producers. Nov. 23.
- " 753 (1904). Johnson and McKean. Mantles of incandescent gas burners. Nov. 23.
- " 966 (1904). Feld. Treatment of coal gas and other gases containing ammonia and cyanogen for the extraction of ammonia and cyanogen therefrom, and the partial regeneration of the agents employed in the extraction. Nov. 30.
- " 3136 (1904). Conti and Levy. Manufacture of fuel briquettes. Nov. 30.
- " 6972 (1904). Gerard and Fiedler. Electrodes for arc lights. Nov. 23.
- " 22,092 (1904). Robson. Gas producers. Nov. 23.
- " 22,815 (1904). Boulton (Cie. pour la Fabrication des Compteurs et Matériel d'Usines à Gaz). Gas purifiers. Nov. 30.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM, AND MINERAL WAXES.

- [A.] 24,840. Macknight. See under VII.
- [C.S.] 1881 (1904). Schulze and Chem. Fabr. Ladenburg. Manufacture of *m*-cresol from crude cresol. Nov. 30.
- " 22,238 (1904). Koellner. See under XII.

IV.—COLOURING MATTERS AND DYESTUFFS.

- [A.] 24,669. Abel (Act.-Ges. f. Anilinfabr.). Manufacture of 1.6- or 1.7-arylnaphthylaminesulphonic acid. Nov. 14.
- " 24,840. Macknight. See under VII.
- " 24,869. Newton (Bayer and Co.). Manufacture of anthraquinone derivatives. Nov. 16.
- " 25,505. Lake (Oehler). Manufacture of chloronitranisol.* Nov. 23.
- " 25,506. Lake (Oehler). Manufacture of sulphur dyes. Nov. 23.
- [C.S.] 1581 (1904). Lake (Oehler). Manufacture of colouring matters. Nov. 23.
- " 3108 (1904). Johnson (Badische Anilin und Soda Fabrik). Preparation of indigo paste for direct use in the fermentation vat. Nov. 30.
- " 4998 (1904). Johnson (Badische Anilin und Soda Fabrik). Manufacture of colouring matters of the anthracene series. Nov. 30.

[C.S.] 13,941 (1904). Lake (Oehler). Manufacture of mordant dyes. Nov. 30.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

[A.] 24,830. Tomlinson (Haas). Apparatus for treating materials with air or other gases for drying, bleaching, conditioning, or other purposes. Nov. 14.

" 24,826. Mavor. *See under I.*

" 24,995. Thomson, Shearer, and O'Brien. Process for retting flax. Nov. 17.

" 25,165. Calico Printers' Association, Ltd., and Warr. Mordanting vegetable fibres for dyeing and printing. Nov. 19.

" 25,166. Calico Printers' Association, Ltd., and Warr. Treating vegetable fibres to render them less inflammable. Nov. 19.

" 25,167. Calico Printers' Association, Ltd., and Warr. Treating vegetable fibres to render them less inflammable. Nov. 19.

" 25,208. Détré. Apparatus for subjecting textile or other materials or substances to the action of liquids under pressure for dyeing, mordanting, bleaching, washing, exhausting, extracting, or performing other operations thereon.* Nov. 19.

" 25,252. Spears. Method of printing textile fabrics, paper, and other materials. Nov. 21.

" 25,284. Johnson (Badische Anilin und Soda Fabrik). The discharge of dyed textile fabrics. Nov. 21.

" 25,296. Todtenhaupt. Process for the preparation of artificial silk or hair. Nov. 21.

" 25,702. Watson. Means for the manufacture of fibrous fireproof sheet.* Nov. 25.

" 25,703. Scharmann. Apparatus for treating textile fabrics and other goods with liquids. [Fr. Appl., Feb. 26, 1904.]* Nov. 25.

" 25,704. Scharmann. Apparatus for treating textile fabrics and other goods with liquids. [Fr. Appl., Feb. 26, 1904.]* Nov. 25.

" 25,728. Howorth (Soc. Anon. Cooperativa Per La Stagionatura E. L'Assaggio Delle Sete ed Affini). Processes for dyeing or charging silks with tin compounds.* Nov. 25.

[C.S.] 25,000 (1903). Wright, Poulson, and Mackintosh. Manufacture of compounds for waterproofing textile and other fabrics, string, ropes, and the like, and apparatus therefor. Nov. 23.

" 1466 (1904). Smith and Schute. Cylinders used in treating or cleansing wool, hair, and other fibres. Nov. 30.

" 4626 (1904). Norton and Hellewell. Means for and method of treating or finishing pile fabrics. Nov. 30.

" 19,007 (1904). Barbour and Montgomery. Preparing machinery for flax, hemp, and similar fibres. Nov. 30.

" 21,397 (1904). Cadgène. Machinery used in dyeing, bleaching, or washing fabrics in the piece. Nov. 30.

VI.—COLOURING WOOD, PAPER, LEATHER, ETC.

[A.] 25,252. Spears. *See under V.*

" 25,594. Becher. Colouring, darkening, or staining wood, and means employed therein. Nov. 24.

[C.S.] 22,547 (1904). Lake (Chem. Techn. Fabrik Dr. A. R. W. Brand und Co.). *See under IX.*

VII.—ACIDS, ALKALIS, AND SALTS.

[A.] 24,731. Plummer. Process to obtain magnesium oxide and hydrochloric acid. Nov. 15.

" 24,798. Lamprey. Apparatus for the production of ozone. Nov. 15.

[A.] 24,840. Macknight. Process of treating soot to recover ammonia, pyridine, and aniline dye therefrom, and the production of a black pigment. Nov. 16.

" 24,885. Simons. Apparatus for treating pyrites for the recovery of sulphur fumes.* Nov. 16.

" 24,978. Wulze, and Gebr. Heyl G. m. b. H. Process for manufacturing and transporting carbonic acid in solid form. Nov. 17.

" 25,010. Westdeutsche Thomsphosphatwerke Ges. m. b. H. *See under XI.*

" 25,107. Tcherniac. Manufacture of sulphocyanide. Nov. 18.

" 25,254. Garroway. Manufacture of sulphate of iron from waste iron and tin scrap iron. Nov. 22.

" 25,394. Watson. Means for obtaining a dissolution of sodium silicate.* Nov. 22.

[C.S.] 27,688 (1903). Gutensohn. Compound for treating sea water to prevent incrustation and corrosion in vessels in which it is evaporated. Nov. 30.

" 295 (1904). Blackmarr and Wilford. Method of and apparatus for converting oxygen into ozone. Nov. 30.

" 966 (1904). Feld. *See under II.*

" 1452 (1904). Grossmann. Manufacture of alkali nitrites. Nov. 30.

" 3349 (1904). Bloxam (Administration der Mimen von Buchsweiler). Manufacture of sodium ferrocyanide. Nov. 30.

" 14,481 (1904). Pictet. Apparatus for the separation of nitrogen and oxygen from atmospheric air. Nov. 23.

" 22,940 (1904). Reaney. Manufacture of hydrated lime from quicklime. Nov. 30.

VIII.—GLASS, POTTERY, AND ENAMELS.

[A.] 24,626. Sankey. Enamelling metallic surfaces. Nov. 14.

" 25,414. Lang. Crucibles suitable for the manufacture of glass. [Fr. Appl., May 19, 1904.]* Nov. 22.

[C.S.] 26,363 (1903). Cunynghame. *See under X.*

" 1933 (1904). Marzin. Ceramic printing and the like. Nov. 30.

" 15,866 (1904). Arbogast. Method of manufacturing glassware. Nov. 30.

" 19,067 (1904). Baudoux. Glass-melting furnaces. Nov. 30.

" 20,444 (1904). Forster. Manufacture of glass, and apparatus therefor. Nov. 23.

" 22,065 (1904). Imray (Window Glass Machine Co.). Manufacture of sheet glass, and apparatus therefor. Nov. 23.

" 22,655 (1904). Imray (Pressed Prism Plate Glass Co.). Manufacture of glass sheets or slabs. Nov. 23.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

[A.] 24,712. Kwiatkowski. Process of making bricks, artificial stone, and similar products.* Nov. 15.

" 24,892. Ford. Manufacture of artificial stone or sand-lime bricks. Nov. 16.

" 24,916. Latham. Utilisation of old plaster casts and other hydrated sulphate of lime, and apparatus therefor. Nov. 16.

" 25,128. Marga. Fireproof, acid-proof, and electrically insulating material.* Nov. 15.

" 25,187. Von Prunk'l. Process for producing durable street pavements and railway sub-structures.* Nov. 19.

" 25,189. Starke. *See under XI.*

" 25,227. Hamblet. Brick kilns and the like. Nov. 21.

- [A.] 25,424. Ebers. Process for manufacturing cements from hot fluid slag by the addition of lime or calcareous substances. Nov. 22.
- [C.S.] 199 (1904). Mathesius. Process for manufacturing slag powder. Nov. 30.
- " 22,423 (1904). Fairweather (Nettleton). *See under XIII.A.*
- " 22,547 (1904). Lake (Chem. Techn. Fabr. Dr. A. R. W. Brand und Co.). Process for colouring natural stone. Nov. 30.
- " 22,780 (1904). Shoppee. Facing bricks. Nov. 30.

X.—METALLURGY.

- [A.] 24,622. MacArthur. Removal of antimony from alloys of gold and other metals containing it. Nov. 14.
- " 24,626. Sankey. *See under VIII.*
- " 24,645. Duncan. Production of iron and steel. Nov. 14.
- " 24,781. Blackmore. Process of reducing aluminium and other metals, and making alloys thereof.* Nov. 15.
- " 24,820. Craig. Metal-melting furnaces. Nov. 16.
- " 24,823. Webb, Brettell, and Adamson. Smelting of and operating by air upon iron and other metals. Nov. 16.
- " 25,116. Moore. Apparatus for separating particles of gold, &c., from the gangue or material with which it is associated. Nov. 18.
- " 25,270. Jackson. Solder for aluminium and other metals. Nov. 21.
- " 25,796. Drojecki. Reverberatory furnaces.* Nov. 26.
- " 25,799. Wynne. Apparatus for atomising molten blast furnace slag. Nov. 26.
- [C.S.] 24,924 (1903). Neo-Métallurgie. Metallic alloy or compound. Nov. 28.
- " 25,550 (1903). Clotten. *See under XI.*
- " 26,363 (1903). Cunynghame. Furnaces or kilns for enamelling, melting, or baking metals, glass, porcelain, pottery, and the like. Nov. 30.
- " 755 (1904). Foster. Manufacture of iron in blast furnaces. Nov. 23.
- " 1823 (1904). Sharpe and Raine. Utilisation of scrap iron and steel. Nov. 30.
- " 1365 (1904). Talbot. Regenerative furnaces. Nov. 23.
- " 6945 (1904). Jacobsen. Manufacture of alloys. Nov. 23.
- " 20,242 (1904). Canivé. Welding and annealing furnace. Nov. 23.
- " 21,766 (1904). Siemens und Halske A.-G. Purification of tantalum metal. Nov. 23.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

- [A.] 24,689. Roselle. Electric storage batteries. [Fr. Appl., Nov. 16, 1903.]* Nov. 14.
- " 25,010. Westdeutsche Thomasphosphatwerke Ges. m. b. H. Process for producing nitric acid by aid of electricity. [Ger. Appl., Oct. 19, 1904.]* Nov. 17.
- " 25,095. Jungner. Electric accumulators.* Nov. 18.
- " 25,114. De la Croix and Joel. Electric accumulators.* Nov. 18.
- " 25,189. Starke. Composition for electrical conduits. Nov. 19.
- " 25,265. Boulton (Accumulatoren und Electricitätswerke Act.-Ges., vorm. W. A. Boese and Co.). Manufacture of storage battery or accumulator electrodes. Nov. 21.
- " 25,282. Siemens und Halske Act.-Ges. Electrode for apparatus producing radiant electric energy. [German Appl., Nov. 24, 1903.]* Nov. 21.

- [A.] 25,331. Hargreaves. Treating the contents of electrolytic cells. Nov. 22.
- " 25,376. Csanyi, Klupathy, and von Bárczay. Electric batteries. Nov. 22.
- [C.S.] 25,550 (1903). Clotten. Process and apparatus for the electrolytic recovery of tin from materials, and for the simultaneous recovery of other metals. Nov. 30.
- " 214 (1904). Kamperdyk. Electric batteries. Nov. 23.
- " 1036 (1904). Pescatore. Accumulators. Nov. 23.
- " 20,003 (1904). Birkeland and Eyde. Process and furnace for subjecting solid materials to the action of the electric arc. Nov. 30.
- " 20,896 (1904). Bosquet. Manufacture of water jackets, casings, &c., by electrolytic means. Nov. 23.
- " 21,403 (1904). Jungner. Method for increasing the activity in electrode masses of badly conductive metallic oxides or hydrates in accumulators with invariable electrolyte. Nov. 23.
- " 21,913 (1904). Ziegenberg. Manufacture of galvanic cells. Nov. 23.

XII.—FATTY OILS, FATS, WAXES, AND SOAP.

- [A.] 24,713. Lewkowitsch. *See under XVIII. A.*
- " 24,913. Lucas. Detergents. Nov. 16.
- " 25,683. Harrison, Wild, and Robb. Means and process for extracting oil from cod livers and the like. Nov. 25.
- [C.S.] 18,152 (1904). Nusch (Chem. Werke, vorm. Dr. C. Zerbe). *See under XVIII. C.*
- " 22,238 (1904). Koellner. Apparatus for purifying oil and the like. Nov. 23.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, ETC.

(A.)—PIGMENTS, PAINTS.

- [A.] 24,738. Bennett and Mastin. Manufacture of pigments. Nov. 15.
- " 24,840. Macknight. *See under VII.*
- " 24,989. Schobert. Antifouling and preservative paint.* Nov. 17.
- " 25,092. Flack (Williams). Writing ink. Nov. 18.
- [C.S.] 22,423 (1904). Fairweather (Nettleton). Composition of matter for fireproof paint or coating. Nov. 30.

(B.)—RESINS, VARNISHES.

- [A.] 24,826. Mavor. *See under I.*

(C.)—INDIA-RUBBER.

- [A.] 24,691. Kite. Rubber vulcanising apparatus. Nov. 14.
- " 24,966. Jacobs, Jacobs, and Brockwell. India-rubber substitute. Nov. 17.
- " 24,548. Gittings. Manufacture of india-rubber substitute. Nov. 26.
- [C.S.] 4200 (1904). Frost. Vulcanising apparatus. Nov. 23.

XIV.—TANNING; LEATHER, GLUE, SIZE, ETC.

- [A.] 19,514A. Amend. The de-acidifying and oxidising of hides and skins. [U.S. Appl., Nov. 6, 1903.]* Nov. 26.
- [C.S.] 1144 (1904). Parkes. *See under I.*
- " 22,395 (1904). De Marneffe. Process of and apparatus for tanning leather. Nov. 23.
- " 22,774 (1904). Smith. Method of preparing leather in the manufacture of the soles of boots and shoes. Nov. 30.

XV.—MANURES, ETC.

- [C.S.] 25 (1904). Tivey and Andrews (Wardle). Manufacture of artificial manure from sewage and other like matter. Nov. 30.

XVI.—SUGAR, STARCH, GUM, Etc.

- [C.S.] 4792 (1904). Reynaud. Manufacture of achroodextrin. Nov. 23.
 „ 22,868 (1904). Moullin and Doubtfire. Brilliant glaze for use with starch. Nov. 30.

XVII.—BREWING, WINES, SPIRITS, Etc.

- [A.] 24,944. De Kerchove and Lobbe. Fermentation and clarification of alcoholic liquids.* Nov. 17.
 „ 25,744. Gates. Brewing. Nov. 26.
 [C.S.] 28,184 (1903). Claussen. Manufacture of English beers or malt liquors, and the production of pure yeast cultures for use therein. Nov. 23.

XVIII.—FOODS; SANITATION, WATER PURIFICATION; & DISINFECTANTS.

(A).—FOODS.

- [A.] 24,713. Lewkowitsch. Refining oils and fats for edible purposes. Nov. 15.
 „ 25,076. Hatmaker. Dry compound of coffee and milk and process of making same. Nov. 18.
 „ 25,077. Hatmaker. Drying blood and fluid extracts and preparations of animal tissue with or without the addition of other substances. Nov. 18.
 „ 25,514. Breckwoldt. Process for the preservation of food or other perishable substances.* Nov. 28.
 „ 25,546. Robinson and Backhouse. Apparatus for treating flour, &c., for bleaching or improving the quality thereof. Nov. 24.
 „ 25,624. Székely and Kovác. Process for making an easily digestible milk preparation free from germs. Nov. 24.
 „ 25,660. Crocker. Food preparation. Nov. 25.
 „ 25,767. Hatmaker. Dry compounds of cacao or other nuts and milk in flaky form, and process for making same. Nov. 26.
 [C.S.] 20,273 (1904). Bromhead (Chem. Fabrik Helfenberg, Ltd.). See under XX.
 „ 22,453 (1904). Rust. Process of making butter. Nov. 30.

(B).—SANITATION; WATER PURIFICATION.

- [A.] 24,808. Robins. Method and means for treating smoke, steam, sewer gas, impure air, and other fumes for the prevention or mitigation of a nuisance. Nov. 15.
 „ 24,906. Garle. Treatment of impure air. Nov. 16.
 „ 25,067. Oates. The aerating and drainage of filter beds, sewage or trade effluent tanks, &c. Nov. 18.
 „ 25,147. Bolton and Mills. Revolving sprinklers used for sprinkling sewage on bacteria beds. Nov. 19.
 „ 25,591. Neilson. Process of and receptacles for the treatment of sewage. Nov. 24.
 „ 25,611. Brooke. Apparatus for purifying fluids. Nov. 24.
 „ 25,691. Guy. The treatment of sewage and means therefor. Nov. 25.
 [C.S.] 28,586 (1903). Cambier, Tixier, and Adnet. Process of sterilising liquids, particularly water. Nov. 23.
 „ 25 (1904). Tivey and Andrews (Wardle). See under XV.
 „ 22,235 (1904). Wicks and Dodd. Distribution of sewage effluent or other liquid over bacteria or filter beds. Nov. 23.

(C).—DISINFECTANTS.

- [A.] 25,308. Gauthier. Process and apparatus for the manufacture of a gas for disinfecting purposes. [Fr. Appl., Nov. 21, 1903.]* Nov. 21.

- [C.S.] 18,152 (1904). Nusch (Chem. Werke, vorm. Dr. C. Zerbe). Process for making durable soap preparations for use in preventing poisoning by compounds of lead, copper, arsenic, mercury, and other metals. Nov. 22.

XIX.—PAPEE, PASTEBOARD, Etc.

- [A.] 25,726. Tailfer. Paper-making machines. [Fr. Appl., Dec. 21, 1903.]* Nov. 25.
 [C.S.] 8885 (1904). Von Schmaedel. Manufacture or treatment of paper for printing. Nov. 30.
 „ 16,281 (1904). Werle. Grinding wood for the manufacture of paper. Nov. 30.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

- [A.] 24,672. Imray (Meister, Lucius und Brüning). Manufacture of crystallised methyl and ethyl salicylglycolates, and of a product therefrom for use in therapeutics. Nov. 14.
 „ 24,685. Bouake, Roberts, and Co., Ltd. (Allen). Production of formaldehyde. Nov. 14.
 „ 24,870. Southworth. See under I.
 „ 24,990. Imray (Meister, Lucius und Brüning). Manufacture of alkylbarbituric acids. Nov. 17.
 „ 25,221. Boulton (Boehringer und Sohn). Manufacture of pure lactic acid. Nov. 19.
 „ 25,369. Williams (von Forell). Products suitable for external medical use and process for manufacturing the same.* Nov. 22.
 [C.S.] 20,273 (1904). Bromhead (Chem. Fabr. Helfenberg). Production of a stable non-alcoholic solution of iron peptone or iron manganese peptone. Nov. 30.
 „ 21,047 (1904). Darzens. Manufacture of certain aldehydes and intermediate products. Nov. 30.
 „ 22,064 (1904). Meister, Lucius und Brüning. Manufacture of phenylmethyramidochloropyrazole. Nov. 30.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

- [A.] 24,774. Bry. Films for photography.* Nov. 15.
 „ 25,718. Soc. Anon. des Plaques et Papiers Photographiques, A. Lumière et ses Fils. Sensitised plates for a process of colour photography. [Fr. Appl., Jan. 13, 1904.]* Nov. 25.
 „ 25,752. Gittings. Colour photography. Nov. 26.
 [C.S.] 925 (1904). Abel (A.-G. f. Anilinfabr.). Films for use in photography. Nov. 28.

XXII.—EXPLOSIVES, MATCHES, Etc.

- [A.] 24,782. Dattenhofer. Manufacture of explosives.* Nov. 15.
 „ 25,398. The New Explosive Co., Ltd., and Ody. Explosive compositions. Nov. 22.
 „ 25,797. Johnson (Soc. Anon. des Poudres et Dynamites). Manufacture of explosives.* Nov. 26.
 [C.S.] 27,515 (1903). Lake (Cyanid-Ges. m. b. H.). Explosives. Nov. 23.
 „ 4742 (1904). Miners' Safety Explosive Co., Ltd., and Levett. Safety explosives. Nov. 30.
 „ 21,398 (1904). Luciani. Machine for use in the manufacture of gunpowder sheets. Nov. 30.
 „ 22,805 (1904). Parker. Art of making matches. Nov. 30.

XXIII.—GENERAL ANALYTICAL CHEMISTRY.

- [A.] 24,975. Bennet. Apparatus for comparing the illuminating effects or consumption of gas burners. Nov. 17.

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Official Notices.

THE NOBEL PRIZE AND THE LAVOISIER MEDAL.

The Nobel Prize for Chemistry for the current year, which amounts to nearly 8000*l.*, has been awarded to Sir Wm. Ramsay for his researches on the atmosphere.

The Lavoisier Gold Medal has been awarded by the French Academy of Sciences to Sir James Dewar for his researches on the liquefaction of gases.

THE JOURNAL.

From the beginning of next year the Society's Journal will be printed and published by Messrs. Vacher and Sons, Great Smith Street, Westminster, S.W., to whom all communications regarding subscribers' copies and advertisements should be sent.

SUBSCRIPTIONS FOR 1905.

Members are reminded that the subscription of 25*s.* for 1905, payable on January 1st next, should be sent in good time to the Hon. Treasurer (Mr. Samuel Hall), in order to ensure continuity in the receipt of the Society's Journal. Any changes of address to appear in the new List of Members now in course of preparation should reach the General Secretary not later than January 15th, 1905.

COMMUNICATIONS.

Authors of communications read before the Society, or any of its Local Sections, are requested to take notice that under Rule 43 of the Bye-laws the Society has the right of priority of publication for three months of all such papers. Infringement of this Bye-law renders papers liable to be rejected by the Publication Committee, or ordered to be abstracted for the Journal, in which case no reprints can be furnished to the author.

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Deaths.

- Bell, Sir Lowthian, Bart., F.R.S., Rounton Grange, Northallerton. Dec. 20.
- Pooley, Thos. A., Beverley, Walton-on-Thames. Dec. 8.
- Rademacher, H. A., 5, Craven Street, Methuen, Mass., U.S.A. Nov. 16.
- Richmond, W. H., Stalheim, Ecclestone Park, Prescott, Lancs. Aug. 11.

London Section.

Meeting held at Burlington House, on Monday,
December 5th, 1904.

MR. A. GORDON SALAMON IN THE CHAIR.

RASCHIG'S THEORY OF THE LEAD-CHAMBER PROCESS.

BY E. DIVERS, M.D., D.Sc., F.R.S.

These are probably the closing years of the active life of the most celebrated and important process of chemical manufacture ever invented, namely, that by which sulphur

dioxide is made into sulphuric acid by the use of a little nitre. Yet it is only a few months ago that a paper, by a distinguished investigator and successful manufacturer of chemical products—Herr Dr. F. Raschig, of Ludwigshafen am Rhein—appeared in the *Zeitschrift für angewandte Chemie*, re-stating and upholding a remarkable theory of the process, which, though published seventeen years before, may still be styled a new theory, so old is the process to which it refers. This theory is now being actively discussed in the *Zeitschrift* just named, and a good abstract of it has already appeared in our own Journal. The following exposition of its nature may interest many of the members of this Society, for, simple enough in principle, it is based upon facts the knowledge of which is not widely diffused among chemists.

What is wanted, in order to understand the nature of the lead-chamber process, is to know how it happens that the presence of a little reduced nitric acid effects with extraordinary rapidity that atmospheric oxidation of sulphur dioxide, $2\text{SO}_2 + \text{O}_2 + 2\text{H}_2\text{O} = 2\text{SO}_4\text{H}_2$, which otherwise scarcely takes place at all. The pair of equations, $\text{N}_2\text{O}_4 + 2\text{SO}_2 + 2\text{H}_2\text{O} = 2\text{NO} + 2\text{H}_2\text{SO}_4$ and $2\text{NO} + \text{O}_2 = \text{N}_2\text{O}_4$, may express what happens, but tell nothing as to how it happens. From them it appears that nitric oxide and oxygen unite into nitric peroxide, but as it cannot be assumed in reading the first equation that, with equal facility and as a matter of fact, nitric peroxide decomposes into oxygen and nitric oxide, these equations fail to give the required information. Lunge's pair of equations, $2\text{SO}_2 + \text{NO} + \text{NO}_2 + \text{O}_2 + \text{H}_2\text{O} = 2\text{ONOSO}_2\text{OH}$, and $2\text{ONOSO}_2\text{OH} + \text{H}_2\text{O} = \text{NO} + \text{NO}_2 + 2\text{H}_2\text{SO}_4\text{OH}$, are open to the same criticism. An advance is, indeed, made, by the recognition of the necessity of there being some combination between the sulphur dioxide and one of the oxides of nitrogen. But still, it is not to be seen from Lunge's equation, in what way the atmospheric oxygen goes to the sulphur dioxide. When, in presence of air, sulphur dioxide and nitrous acid or nitric peroxide are brought together in water, they unite without oxidation to form compounds which, though unstable, are not oxidisable by the air. So far, therefore, it remains unexplained how the sulphur dioxide gets oxidised into sulphuric acid. According to Raschig's theory, the sulphur dioxide does not get oxidised by the air: there is only a condensation or union of the sulphur dioxide with the nitrous acid. The compound hydrolyses, and thus sulphuric acid comes into existence. Then only does aerial oxidation intervene, in order to oxidise the reduced nitrous acid.

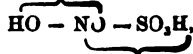
Raschig's theory of the lead-chamber process runs, in effect, as follows:—Nitrous acid and moist sulphur dioxide combine together to form the substance, nitrososulphonic acid, ONSO_2H ; this interacts with a second molecule of nitrous acid to form sulphuric acid and nitric oxide; and this nitric oxide, with the aid of air and water, regenerates the nitrous acid set out with. Here are the equations:—

- (1) $2\text{ONOH} + 2\text{SO}_2 = 2\text{ON}.\text{SO}_2.\text{OH}$;
- (2) $2\text{ONOH} + 2\text{ON}.\text{SO}_2.\text{OH} = 4\text{NO} + 2\text{H}_2\text{O}.\text{SO}_2.\text{OH}$;
- (3) $4\text{NO} + \text{O}_2 + 2\text{H}_2\text{O} = 4\text{ON}.\text{OH}$.

Here, for the first time, is given a theory as to how sulphur dioxide passes into sulphuric acid in the nitre process of its manufacture. It may be claimed for it that it expresses the facts of the process, and is not merely a hypothetical view of it.

The lead-chamber process has long held the position, in the exposition of chemistry, of the standard example of catalytic action. Now a true catalytic action is one in which there are, between the substances concerned—say, sulphur dioxide, oxygen, and water—and the substances produced from them—in this case, sulphuric acid—two other substances, whose lines of existence cut each other, so to speak, at a critical point. At that point the one substance is there facing the substances to be consumed, and equally there at that point is the other substance of the catalytic pair, facing the substances produced. Where catalytic action is going on, the existence of both of its acting substances is almost limited to a point in time; when either attains a line of existence, the catalytic action is at an end, and the other

substance no longer exists. In the present case, this state of things may perhaps be symbolised, thus:—



where the brackets include nitrous acid and nitrososulphonic acid, respectively. During catalytic action, both have an existence which is intangible, which defies direct observation. Only when, by changed conditions, the catalysis is disturbed, can we expect to find the one or the other. In the lead chamber itself, we find the nitrous acid (or the products of its break-up), when the catalysis is over, under the conditions which prevail. In his beaker glass, under other conditions, Raschig gets evidence of the existence of nitrososulphonic acid. But in the lead-chamber itself, in the region of full activity, there should be no detectable presence of this body or of nitrous acid. Admitting, with Lunge, that nitrososulphuric acid is one of a catalytic pair of substances in the lead-chamber process, the same argument holds good concerning the form of existence of that substance also. He may be right in believing that it is present in vast quantities in the lead-chambers—return to this point will be made later on,—but, even so, its existence may be likened to that of a twinkling star—there and not there at every alternate moment, without any tangible presence, until the catalytic action proper to normal working is disturbed. It, therefore, does not really affect Raschig's theory, to deny that nitrososulphonic acid, with which may be associated nitrous acid and nitric oxide, is to be found in the normally working parts of the chamber. But, before following up these considerations with some others of importance, the subject of the existence and nature of nitrososulphonic acid requires to be discussed.

Nitrososulphonic acid has not been isolated and probably never will be. Almost as much may be said of nitrous acid. But there is abundant evidence of the existence of the latter in dilute solution, whilst its salts are common substances. The evidence of the existence of nitrososulphonic acid, and the relations of this body to certain salts, will now be briefly gone into.

The earlier evidence brought forward, first by Claus and then by Raschig, of the existence of salts of nitrososulphonic acid, or of its hydrate, dihydroxylaminesulphonic acid, as yet indistinguishable from it, has been proved to be wrong by Haga and the author. When an alkali nitrite is sulphonated by the gradual addition of metasulphite, the product is not a dihydroxylaminesulphonate, but hydroxylaminesdisulphonate, $2\text{NaNO}_2 + 2\text{Na}_2\text{S}_2\text{O}_5 + \text{H}_2\text{O} = 2\text{HON}(\text{SO}_3\text{Na})_2 + 2\text{Na}_2\text{SO}_3$. But by a very interesting, though somewhat reconcile, analytical procedure, Raschig has convinced himself that, when the nitrite is put from the first in contact with the whole of the metasulphite, there comes into brief existence what should be nitrososulphonate or else its hydrate, dihydroxylaminesulphonate; produced thus: $\text{NaNO}_2 + \text{Na}_2\text{S}_2\text{O}_5 = \text{ONSO}_3\text{Na} + \text{Na}_2\text{SO}_3$.

Next, experimenting with dilute titrated solutions of sulphur dioxide and nitrous acid, Raschig poured sulphur dioxide solution into highly dilute nitrous acid solution in varying proportions, and found that interaction was confined within molecular proportions, $\text{ONOH}:\text{SO}_2$. But he thus got sulphuric acid and no trace of nitrososulphonic acid. When, however, he poured the nitrous acid solution into the sulphur dioxide solution, kept in excess, he found that more than a molecule of sulphur dioxide was used up, proving that hydroxylaminesdisulphonic acid and nitrososulphonic acid, $\text{N}(\text{SO}_3\text{H})_2$, must have been formed. Here, it may be mentioned, that Carpenter and Linder, two years ago (this Journal, 21, 149), found that sulphur dioxide produced hydroxylaminesdisulphonic acid with nitrous acid. Raschig concludes that these two experiments prove that dihydroxylaminesulphonic acid or its anhydride, nitrososulphonic acid, is produced and then becomes hydroxylaminesdisulphonic acid by further sulphonation. The author cannot admit that that is the conclusion which must be drawn, but he sees not the least reason for refusing to grant that, in presence of other reagents, the sulphonation may go so far only as to produce nitrososulphonic acid.

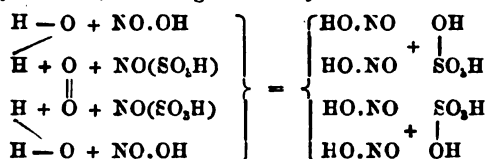
Raschig's third point of evidence is decidedly satisfactory. On mixing the highly dilute and cooled solutions of nitrous acid and sulphur dioxide in molecular proportions, the mixed solution gives no blueing with potassium iodide and starch, thus showing the disappearance of all nitrous acid; no bleaching of iodine solution, thus showing the disappearance of all sulphur dioxide; precipitation of all sulphur as sulphate by barium chloride; and, lastly, considerable bleaching activity upon potassium permanganate. Therefore, although nitrous oxide is obtained by heating the solution, the primary interaction cannot be that expressed by $2\text{HO}\cdot\text{NO} + 2\text{SO}_2 + \text{H}_2\text{O} = \text{N}_2\text{O} + 2\text{SO}_2(\text{OH})_2$, since nitrous oxide has no action upon permanganate. The interaction can only have produced nitrososulphonic acid, which must have hydrolysed into nitrosyl hydride, $\text{H}\cdot\text{NO}$, thus: $-\text{ON}\cdot\text{OH} + \text{SO}_2 = -\text{ON}\cdot\text{SO}_2\cdot\text{OH}$, and $\text{ON}\cdot\text{SO}_2\cdot\text{OH} + \text{H}_2\text{O} = \text{ON}\cdot\text{H} + \text{HO}\cdot\text{SO}_2\cdot\text{OH}$. Working with stannous chloride, in place of sulphur dioxide, upon nitrous acid, much stronger solutions of this substance, nitrosyl hydride, are obtainable—solution is much too concentrated to be merely solutions of nitrous oxide. The action of stannous chloride upon nitrous acid is so definite that, were it needed, it could be used for its quantitative determination. Nitrosyl hydride stands as anhydride to dihydroxylamine, $(\text{HO})_2\text{NH}$, and it is difficult to avoid coming to the conclusion that either nitrosyl hydride or dihydroxylamine is temporarily present in the solution in which nitrous acid has been sulphonated. But, if this is granted, it follows that either nitrososulphonic acid or dihydroxylaminesulphonic acid is produced by this sulphonation, however fleeting its existence. Raschig has obtained evidence that nitrosyl hydride is also produced by oxidising hydroxylamine.

Nitrosyl hydride interacts with nitrosyl hydroxide, that is, nitrous acid, though not readily, to form nitric oxide and water: $-\text{ON}\cdot\text{H} + \text{HO}\cdot\text{NO} = 2\text{NO} + \text{H}_2\text{O}$. In presence of air dissolved in the water, it proceeds quickly enough, but then nitrous acid appears in place of the nitric oxide, in accordance with the third equation. It has still to be shown that the conditions of the lead-chamber are appropriate for the occurrences formulated in Raschig's equations.

The solutions experimented upon have so far been aqueous, but the addition of sulphuric acid to them, far from being detrimental, actually determines that activity of nitrous acid upon the nitrososulphonic acid, in the presence of air, which in aqueous solutions only slowly manifests itself. When the nitrous acid is dissolved in 10N sulphuric acid, instead of in water, sulphur dioxide and air can be blown rapidly into the solution, with complete conversion of the sulphur dioxide into sulphuric acid and no escape of nitric oxide and peroxide, although the sulphuric acid is still too weak to be a solvent of nitrososulphuric acid (nitrosyl sulphate). Indeed, the addition of enough sulphuric acid to make the solution similar to chamber acid, makes the solution such a poor solvent of nitrous acid that this then becomes gaseous to some extent. The effect of still stronger sulphuric acid, which would have generated nitrososulphuric acid, appears not to have been tried. But it has at least been shown that the lead-chamber process can be imitated in a beaker glass, in accordance with Raschig's theory and without any material production of nitrososulphuric acid.

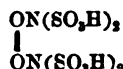
Bearing in mind the essential nature of catalytic action, it will be evident that the series of equations drawn up to represent its cycle of changes are not to be regarded as expressing interactions which proceed, independently to each other, to actual completion. Thus, in Raschig's equations, the product of the first interaction, namely, nitrososulphonic acid, is already reacting as in the second equation, before it is out of the reaction represented by the first equation. The same holds true of the active product (nitric oxide) of the second equation, which is being formed only so far as to be able to pass into the third reaction and there disappear. We have also to remember that the ordinal numbers attached to these equations, first, second, and third, serve only to mark their sequence, not to indicate a beginning and an end. The product of the reaction shown by the third equation, the nitrous acid, passes in the moment of its formation into the reaction as shown by the first equation. It was incumbent upon Raschig to give reality to the existence of the nitrososulphonic acid, or of a

substance equivalent to it, but not to show that it might be isolated from the contents of the lead chambers. The same is true of his nitric oxide, but this being so well-known a substance, the above considerations seem not to have been applied to it. Raschig may be found saying that Lunge will yet have to come back to the recognition of nitric oxide as taking part in the process, and also making no attempt to meet Lunge's well-founded contention that nitric oxide is only present in the lead chamber in association with enough nitric peroxide to negative the possibility of its taking part in the process. Yet Raschig himself recognises quite well that the NO of his equations has only a catalytic existence as nitric oxide. He has done some admirable work towards establishing the existence of pernitric acid, HNO_3 , and allows himself to speculate whether this substance, as well as NO, may not play a part in the process shown in equation 2. However that may be, it is in any case to be understood that nitric oxide, as we know it, has not been shown by Raschig's experiments to be a factor in the sulphuric acid process. His second equation must hardly be taken to express something which actually goes on of itself, for his experiments show that this reaction depends largely, if not wholly, for its occurrence upon the co-operation of the reaction formulated by the third equation. Equation 3 must be imagined to be subjoined to 2, something in this way:—



in which the radical, NO, is seen to be everywhere active, without once coming out into existence as nitric oxide.

Raschig's surmise that, in passing from the reaction formulated in his second equation to that expressed by his third, there may be generated pernitric acid, HNO_3 , as well as NO, may puzzle those who see in the action of sulphur dioxide only that of a reducing agent upon nitrous acid. It may be well, therefore, for this and other reasons, to call attention to the fact that, in presence of the monohydrate of sulphuric acid, sulphur dioxide so acts upon nitrous acid as to generate peroxyaminesulphonic acid—



This substance, which gives a beautiful purple colour to the sulphuric acid, is undoubtedly a peroxide, such as pernitric acid would be, $\text{HO}.\text{ONO}.$ with an $-\text{O}_2-$ group in it (J. Chem. Soc. 1904, 85, 108). There is another point of interest in peroxyaminesulphonic acid in connection with the sulphuric acid process. It is the support which its production gives to Raschig's conception of the process as being dependent upon the sulphonation of nitrous acid. Can sulphasotised acids, it has in effect been asked, have anything to do with the sulphuric acid process, in which they are not to be found, at least when it is properly working? The prejudice which dictates such a question will hardly be able to withstand the evidence of such a fact as this:—Whether nitrous acid and sulphur dioxide react in presence of water or in presence of monohydrated sulphuric acid, H_2O , H_2SO_4 , they produce sulphasotised substances, that is, sulphonated nitrous acid compounds. For, that being the case, can the least objection any longer be raised to the assumption that they also form such substances in presence of that more dilute sulphuric acid which is present in the lead-chambers?

What next is to be said is offered as a contribution to the theory of the lead-chamber process. The author has long been convinced that, in those regions of the chamber where the process is in active operation, where, therefore, there is dense white mist, the really gaseous part of the contents of the chamber contains no significant quantity of any oxide of nitrogen. One part of that mist consists of its liquid particles of sulphuric acid, having with it something more than one molecule and something less than two molecules of

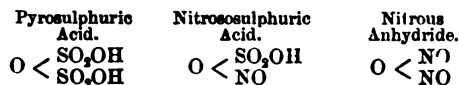
water, and holding in solution all the nitrogen oxides, one or more as the case may be. The other part of the mist is gaseous, and made up of atmospheric nitrogen and oxygen, sulphur dioxide, and vapour of water. In regions where the activity is much less, nitrogen peroxide is, indeed, among the gases, and with very little sulphur dioxide present, but this nitric peroxide is already out of the sphere of activity, and waiting to be carried off from the chambers. If it had work to do, it would not be there as gas. Whether any of the oxides of nitrogen enter the chamber from the Glover-tower in the form of mist, or whether everything is at that time gaseous, cannot, perhaps, be told, but, quickly and almost at once, the whole of the nitrogen oxides, together with water and sulphur dioxide, and probably some volatilised or mechanically carried sulphuric acid, will condense into a mist. It is difficult to conceive of another state of things, consistent with the conditions which prevail. What follows next in the process seems to be equally certain. Sulphur dioxide, oxygen, and water condense together upon the liquid particles of the mist, there uniting, under the catalytic influence of the nitrous acid present in the particles, with a rapidity limited only by the time needed for diffusion of the gases over to the particles and for dissipation of the heat caused by their condensation. But, no doubt, that rapidity of the process is seriously interfered with by the unequal distribution of the steam or water-spray through the chambers, the condensation being checked in one place because the nitrous acid loses much of its activity in consequence of the sulphuric acid of the mist liquid being too concentrated, and in another place because, through the sulphuric acid of the mist being too much diluted, the nitrous acid escapes from the liquid particles, and, therefore, gets out of its field of greatest activity.

Perhaps, to a large extent, the language of Raschig is consistent with the assumption that he believes in the confinement of the nitrogen compounds to the liquid part of the mist, but he distinctly refers to the necessity of having more oxides of nitrogen present than can be held in solution by sulphuric acid of the dilution he takes it to have in the mist, which is surely much less than that of chamber-floor acid. Besides this, he tries to lead us back to a belief in the existence of gaseous nitrous anhydride, for short periods of time, even in presence of oxygen—a matter which would be of no interest in connection with his theory did he suppose that all his nitrous acid was in the liquid of the mist.

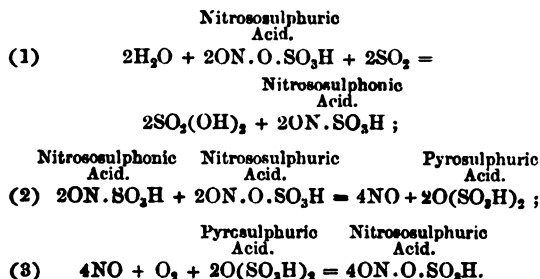
Unless the nitrous acid is held dissolved in the liquid of the mist in the form of nitrososulphuric acid, it is hardly possible to grant the demand of Raschig's theory for nitrous acid to be ever present in local excess of the sulphur dioxide at the seat of activity, that is, in the proportion of $2\text{NO}_2\text{H}$ to every SO_2 .

Yet Raschig fails to find any place for nitrososulphuric acid in the process of sulphuric acid manufacture. If it is present at all in the chambers, it is there, he considers, injuriously, and as the result of imperfect working. According to Lunge, its presence in the chambers is certain and of prime importance. But, before proceeding further, it is desirable to say something respecting the chemical relationship of nitrososulphonic acid to nitrososulphuric acid. The propriety of what is now going to be said on this subject is unlikely to be gainsaid, but disregard of its argument leads to lamentable confusion in nomenclature. The formula of nitrososulphonic acid is $\text{ON}.\text{SO}_3\text{H}$; that for nitrososulphuric acid is $\text{ON}.\text{O}.\text{SO}_3\text{H}$. The relationship of nitrososulphonic acid to nitrososulphuric acid is, therefore, that of the almost unknown sulphurous acid, H_2SO_3 , to sulphuric acid, H_2SO_4 . Nitrososulphuric acid is often named nitrosyl sulphate, but that is a practice not to be commended, because it suggests that this acid is a salt, whereas a salt it is not, nitrosyl being no basic radical. By a sulphonic derivative is meant a compound in which the radical, $-\text{SO}_3\text{H}$, plays a part analogous to that of cyanogen in a cyanide, or of chlorine in a chloride. A sulphuric compound is what is held to be a derivative, in certain ways, of sulphuric acid. When that derivation is through the substitution of a hydrogen radical by some other, it is absolutely unallowable to call the compound a sulphonic derivative, as is so frequently done in the case of nitroso-sulphuric

acid. This substance is a mixed acid oxide, that is, an anhydride of two acids. It is intermediate to pyrosulphuric acid and nitrous anhydride, as thus shown:—



That sulphuric acid charged with nitrososulphuric acid will quickly absorb moist sulphur dioxide has been long known, but it was left for Raschig to discover what then happens. What does happen is expressed by his equations when, for the nitrous acid there shown, is substituted its anhydro compound with sulphuric acid. His three equations then become—



What, then, goes on between the liquid and the gaseous parts of the mist appears to be this. The particles of the mist, consisting of strong sulphuric acid holding nitrososulphuric acid in solution, continuously absorb sulphur dioxide and oxygen, which, by the catalytic action of the nitrososulphuric acid, become sulphuric acid as fast as they are absorbed. Water is taken up in such quantity, in the normal working of the process, as serves to effect incipient hydrolysis of the nitrososulphuric acid into its constituent acids. Two molecules of sulphur dioxide and one molecule of oxygen are absorbed simultaneously, for the reason that they find between themselves, the radical of the catalyser, nitrosyl, one moment as nitrososulphuric acid and the next moment as nitrososulphonic acid. Or, leaving out all mention of the radical, nitrosyl, but remembering that the substance, nitric oxide, plays no part, the catalyser is nitrososulphonic acid and nitrososulphuric acid, alternately. Then, since a catalyser cannot be represented in an equation for a productive change, because it is neither consumed nor generated, the equation comes back to $2SO_2 + O_2 + 2OH_2 = 2SO_3H_2$, conditioned by the words "in presence of a catalyser."

The importance of the theory now advanced, that the production of sulphuric acid in the lead-chambers is due to action going on between a liquid and a gas, will be quickly evident on consideration. That state of things is the counterpart of what is actually observed to go on in Raschig's experiment in a beaker, in which sulphur dioxide and oxygen are rapidly absorbed by the nitrous acid solution, without evolution of any nitric oxide or peroxide. It renders meaningless the otherwise pertinent question raised by Lunge against Raschig's theory, why the nitric oxide does not oxidise to nitric peroxide, instead of stopping at nitrous anhydride, as required of it by Raschig. It, in this way, removes almost the sole objection that Lunge has to any theory of the process, which rests on a production of nitric oxide. But, above all, it should perhaps serve to end the rivalry between Lunge's and Raschig's theories, because it makes them to be, with some excrescences, parts of a more comprehensive theory.

There is much more in Raschig's account of his theory and of the elaborate experimental work upon which it is based, which might with advantage have been described and commented upon, but it is hoped that what has been here said will be sufficient to excite interest in the theory.

DISCUSSION.

PROF. TILDEN said that it had yet to be shown that these various substances, and the reactions expressed in these equations, were essential parts of the process, the

object of which was the production of sulphuric acid. No one denied, for instance, that nitrososulphuric acid was formed to some extent in the chambers, but it did not seem to him that the production of that compound was a necessary condition of the production of sulphuric acid from the oxides of nitrogen, the oxygen of the air, sulphur dioxide and the water which were present. He was glad to hear that the author held the view that a great number of these substances expressed in the equations probably did not exist under the conditions of the chambers, because they were at a temperature in which they were to a large extent dissociated into gaseous products. He should certainly agree with him that in so far as these reactions took place, they took place on the surface of the spherules of water due to the condensation of the steam. It would be interesting if some experiments could be made at temperatures a little higher, above the boiling point of water, when there would be no condensed spherules of water at all, but where all the materials were entirely gaseous. Such a temperature was of course beyond that which prevailed generally in the vitriol chambers. He was not afraid to express the action of the peroxide of nitrogen which was present in the chambers by a very much simpler hypothesis. They had no hesitation in assuming that when nitric oxide combined with oxygen the process was very simple. He had never seen any form of complicated expression written as an equation to express this combination and he thought it would be extremely difficult to express it by anything more complicated; it might be written as $NO + O$ or $2NO + O_2$. He saw no difficulty about assuming that oxygen was capable of directly combining with nitric oxide, but he felt more difficulty in assuming that oxygen directly combined with the elements of the sulphurous acid which were present in the gases. Those who had not specially studied these substances were frequently a little confused about the oxides of nitrogen, but his belief was that there was only one coloured gaseous oxide of nitrogen and that was the peroxide, the formula of which was NO_2 . His reason for the statement was this: N_2O and NO were well known colourless gases, N_2O_4 was a blue liquid which on conversion into vapour produced a yellow coloured gas. That gas consisted of a mixture of equal volumes of nitric oxide and nitrogen peroxide. It had been shown a few years ago that in all probability when these two gases were brought together there was a small amount of nitrous anhydride produced, something like 5 per cent. of the whole, as represented by Dixon's experiments; the rest was entirely dissociated. If the red gas were examined with the spectroscope the lines of the absorption spectrum were identical with those of the spectrum of peroxide of nitrogen, made in some other way. Peroxide of nitrogen obtained, for example, by heating lead nitrate was by cooling condensed first to a yellow liquid and at a lower temperature to a perfectly colourless solid. This white solid was N_2O_4 or some multiple of it. Directly it volatilised it gave the yellow gas the colour of which appeared because it was continually accumulating, the dissociation increasing as the temperature rose. On examining these bodies with the spectroscope the only one which gave the peculiar absorption spectrum was the nitrogen peroxide, NO_2 , so that N_2O_4 , if it existed in the gaseous state, did not give the absorption spectrum. Now in the vitriol chambers the atmosphere was generally a deep red, showing an abundance of peroxide of nitrogen. It seemed to him that in the chambers where the sulphuric acid was chiefly produced there would always be an abundance of this gas. He could not see any great difficulty in believing that just as oxygen was known to be capable of combining with nitric oxide by simple combination, so an atom of the oxygen of the nitric peroxide attached itself to the elements of the sulphurous acid here present. In nitrogen peroxide the nitrogen had an unsatisfied affinity, and it was easy to conceive of an arrangement by which the oxygen of the air united with the nitrogen of the peroxide of nitrogen, at the same moment that another atom of oxygen was detached by entering into union with the sulphur dioxide and water which together made up the molecule of the sulphuric acid. He could not see any objection to the idea that that was the essential part of the process. Of course the occasional production of hydroxylamine and other compounds could not be denied, but it seemed to him that was sufficiently

explained by the fact that moderately strong sulphuric acid was present in the spherules of liquid and on the walls and floors of the chambers in the presence of sulphur dioxide and nitrogen peroxide in varying proportions. There, at any rate, were the materials for the production of some of the substances represented in these equations.

MR. R. FORBES CARPENTER said he was not prepared for the author accepting the nitrososulphuric acid as an existing body, even under the transient form described, for, in conjunction with Prof. Haga, Dr. Divers had shown that what Raschig described in earlier experiments as a salt of dihydroxylaminesulphonic acid was actually a double salt which could be produced by crystallisation of hydroxylamine disulphonate and potassium nitrite. The combination of the theories of Lunge and Raschig might be happily effected by the equations Dr. Divers had given. That not only the raw materials, but at any rate one product, of the intervention of the two named by Dr. Divers (nitrososulphuric and nitrososulphuric acids) existed through the working of the chambers was evident, as solutions of nitrososulphuric acid could be collected in the drips in the chambers as an indication of how the chamber was working. He had searched for hydroxylaminedisulphonic acid, and only on one occasion was it found as a transient body in a particular part of the chamber plant, viz., in a tower between No. 1 and No. 2 chambers, which was condensing the mist of sulphuric acid still uncondensed, and produced in No. 1; nitrososulphuric acid was there also at times, although at other times it was absent. The presence of this hydroxylaminedisulphonic acid was indicated in alkaline solution on testing with copper sulphate, a canary coloured precipitate being formed, a compound that Dr. Divers had shown them how to obtain. He had unsuccessfully looked for this acid in several other parts of the chamber. He should be glad if Dr. Divers could tell them the temperature at which Raschig's reactions took place in the solutions with which he experimented.

DR. VELEY said that he had observed that nitric acid exposed to light escaped decomposition when it almost filled the bottle, but suffered decomposition when it only partly filled the bottle. These results seemed to show that the initial decomposition of the nitric acid was a decomposition not of the liquid itself, but of the vapour proceeding from that liquid at the ordinary temperature.

MR. F. H. ENGLISH said in the first chamber the temperature was as a rule about 160° F. and in that chamber the bulk of the sulphuric acid was formed. The second chambers were generally about 120° to 180° F.; and the third chamber, where practically no action at all took place and which was filled with nitrogen peroxide, was a little above the air temperature.

MR. OAKDEN said he had found that about 45 per cent. of the total acid was produced in the Glover tower where there could not possibly be these bodies present in the gaseous state. It was produced in contact with the liquid nitrososulphuric acid passing down the Glover tower, independent of the chambers altogether.

DR. L. F. GUTTMANN asked the author why he had called the compound NOH, nitrosyl-hydride; he thought Angeli, its discoverer, had named it nitroxyl.

DR. DIVERS, in reply, said that his theory being that no nitrous gases were present in the very active part of the chambers, because of the large quantities of sulphur dioxide there, he had only one comment to make upon Prof. Tilden's view of the activity of nitric peroxide. That was that that substance could only furnish sulphur dioxide with oxygen indirectly, that is, by the decomposition of some compound which it might form with the sulphur dioxide. Dr. Tilden's conception of the sulphuric-acid process was admittedly based on hypothetical activities, whereas Raschig's theory rested on facts experimentally determined. To illustrate that, it might be mentioned that Raschig had been led to believe that the substance, pernitric acid, was indeed formed in the reaction of nitrous acid with sulphur dioxide, but had omitted from the details of his theory the assumption of its production, because he was as yet unable to convince himself on the point, so desirous was he to have a foundation of fact for every statement. With regard to the evidence for the existence of nitrososulphuric acid in

the lead-chamber, he would mention, what Raschig had pointed out, that chamber acid did not contain more nitrous acid than the same volume of water would easily hold dissolved. It could not, therefore, be assumed that that quantity of nitrous acid was proof of the presence of nitrososulphuric acid. The evidence for its presence in the lead chamber was indirect.

DR. VELEY's experience with nitric acid had its parallel in what happened to a concentrated solution of hydrochloric acid exposed to bright daylight. In a bottle practically full, that acid remained unchanged, whereas, with only a little of its solution in the bottle, chlorine was produced. Since moist hydrochloric acid gas, apart from a liquid solution of it, did not decompose (Richardson), it would seem that, so far as it applied to the case, the behaviour of either nitric or hydrochloric acid in a partly filled bottle favoured the theory put forward in the paper as to what went on in the lead-chamber.

In answer to Dr. L. F. Guttman, "nitroxyl," used already for a radical, appeared to him to be an impossible name for a substance, and particularly inapplicable to one having the composition assigned to nitrosyl hydride.

THEORY OF THE ACTION OF METALS UPON NITRIC ACID.

BY E. DIVERS, M.D., D.Sc., F.R.S.

Introductory.

There being no explicit and connected theory of the action of metals upon nitric acid, which has general acceptance, what follows is submitted for consideration and adoption as such a theory. By theory, it may be wise to point out, is meant not some fanciful and imaginative view, based upon hypotheses, but an exposition of the real order and dependence of the facts presented in the action of the metals upon the acid. Therefore, if this theory is well founded, it should have some value in technological pursuits. It is not new, having been published in 1883 in a paper read before the Chemical Society (J. Chem. Soc., 43, 443), in an incomplete form, and as subsidiary to the subject of the paper, which was on the production of hydroxylamine from nitric acid.

Nor is its existence unrecorded in the proceedings of this Section of the Society of Chemical Industry, it having in 1891 been subjected by Dr. Veley to adverse criticism, which was illustrated by experiments. The occasion for presenting the theory in a more developed form to the Society this evening has been given by the reading last month to the Chemical Society, of an important paper on mercurous nitrite by Prof. Ray, of the Presidency College, Calcutta.

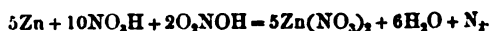
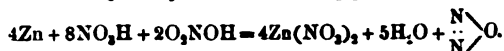
The most convenient and most satisfactory method of treating the subject seems to be to enunciate it without prefatory remarks, and then to develop its points, and endeavour to show that they are well taken.

The Theory.

Silver or mercury is only active upon nitric acid in presence of nitrous acid as catalyser, and then converts it into molecular quantities of silver or mercurous nitrite and nitrate, and nothing else besides water:—

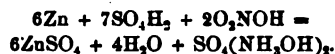


Zinc or tin acts upon nitric acid to produce zinc or stannous nitrate and, independently of each other and without intermediate products, ammonia, nitrous oxide, and nitrogen:—



It tends also and principally to convert the nitric acid into hydroxylamine as the primary product, along with zinc or stannous nitrate. But that tendency is defeated, unless a

stable acid, such as sulphuric or hydrochloric acid, be present to combine with the hydroxylamine, nitric acid itself being obviously unfitted for the purpose:—



Evidence as to the Truth of the Theory.

Two Orders of Metals.—As is well known, one metal may act very differently from another upon nitric acid and also upon sulphuric acid. But, although no two act exactly alike, a division of the metals may be made into two classes, one represented by silver and mercury, and the other by tin and zinc. In the former class are included bismuth and copper, and in the latter class all other metals having strongly marked basic characters. Of the action of copper upon nitric acid it is, however, not yet possible to formulate a satisfactory and convincing theory. For, although, more than that of any other metal, the action of copper comes under the attention of chemists, there is still wanting a sufficient basis of fact to work upon. Probably, Acworth and Armstrong (J. Chem. Soc., 1877, 2, 68) are right in attributing the production of nitrous oxide and nitrogen in this case to a secondary effect peculiar to copper. The division of metals into two classes, according to their behaviour towards nitric acid and sulphuric acid, corresponds with that into metals which cannot decompose water at all and metals which can do so in certain circumstances.

Silver and Mercury inactive upon Nitric Acid in absence of Nitrous Acid and active in its Presence.—The experiments by Russell and, above all, the quantitative experiments by Veley, have established what had already been qualitatively recognised by Millon, that the activity of silver or mercury, copper or bismuth upon nitric acid is hardly measurable, unless and until a sensible quantity of nitrous acid is present, when it is proportionate to the amount of this acid, other things being equal. In this connection, as well as in contrast with the activity of the metal, zinc or tin, it is interesting to note that silver or mercury is also inactive upon its own nitrate, that is, upon the acid radical of its own nitrate; mercury acts, it is true, upon mercuric nitrate, but only to the extent of changing it into a mercurous salt, whilst leaving it as a nitrate. Copper tends, apparently, to act similarly upon cupric nitrate.

Silver or Mercury not permanently inactive upon Nitric Acid.—Silver or mercury, notwithstanding its inactivity at first, can seldom, if ever, remain long in contact with the purest of obtainable nitric acid without action being set up; but then that is because of the dissociation which goes on, however slightly, in which the nitric acid becomes nitrous acid and oxygen, except perhaps when the acid is highly diluted. It is well known to those who have tried it, that nitric acid of moderate concentration cannot be kept free from nitrous acid, and the limit of dilution beyond which no dissociation whatever occurs is as yet unknown, if it exists.

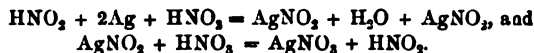
The action of Silver or Mercury upon Nitric Acid in presence of Nitrous Acid.—When silver or mercury is converting nitric acid into molecular quantities of nitrite and nitrate, there will be present a constant quantity of nitrous acid, determined by the degree of dilution of the nitric acid and by its temperature—conditions which must be kept within limits, in order to prevent the occurrence of secondary changes. From Rây's experiments with mercury, it seems that a temperature of 35° and nitric acid of sp. gr. 1.11 at 15° are together suitable conditions for the purpose. The solution in close contact with the mercury then contains about 0.05 grm. of nitrous acid (or its equivalent of nitrite) per c.c. of solution, with from 4.5 to 6 times its equivalent of nitric acid and nitrate. That mercurous nitrite in this case, or silver nitrite in the case of silver, is freely formed, is shown by its abundant separation in the crystalline form, when the solution is of sufficient depth and is left undisturbed over the mercury or silver. That nitrate and nitrite are produced in molecular proportions is a deduction from the fact that, when the action is steadily proceeding, there is no other product than these (not counting water), and, therefore, no material

change in the proportion of nitrous acid to nitric acid. It was Rây's happy thought to examine the mother-liquor during the production of mercurous nitrite under such circumstances as these, that is, when no nitric oxide is escaping from the solution. In that case there is no equation for explaining the action other than that already given, modified to suit the valency of mercury:—



Nitrous Acid, Nitric Oxide, and Nitric Peroxide as Secondary Products.—Nitrous acid is actually formed as a secondary product when some of the nitrite actually produced, that is, produced in the primary action, is decomposed by nitric acid. This decomposition occurs (a) when, as at first, there is not the requisite proportion of nitrous acid already present, and (b) when there is not enough water present to preserve the nitrite from the action of the nitric acid. Nitric peroxide appears as a secondary product when the proportion of water is so low that nitrous acid interacts with nitric acid. Lastly, nitric oxide results as a secondary product when the proportion of water to nitric acid is so large that the nitric acid fails to prevent the nitrous acid decomposing into this substance and nitric acid:— $3\text{HNO}_2 = \text{HNO}_3 + 2\text{NO} + \text{H}_2\text{O}$. The accordance of these assertions with well-known facts is incontrovertible.

Nitrous Acid as Catalyser.—In the steady conversion of silver or mercury into nitrite and nitrate, in presence of adjusted proportions of water and nitrous acid, the nitrous acid is ever being consumed and regenerated at the same rate, thus:—



Nitrous acid is therefore the catalyser, a substance active without being consumed, in that interaction between the metal and the nitric acid by which nitrite and nitrate are simultaneously produced in molecular proportions.

Silver or Mercurous Nitrate is a Primary Product.—It may be suggested, and, indeed, has been (Millon, Russell, Veley), that nitrate of the metal is produced only as a secondary product, that is, by the action of nitric acid upon the nitrite. That it can be and is so produced at times is, of course, the fact. But, surely, it is an unconsidered statement that, in the dissolution of silver in nitric acid containing nitrous acid, the first act is the production of nitrite only, and then that nitrate is produced from it by the action of nitric acid. This way of putting the matter involves, apparently, such inconsistencies as the following:—Nitrous acid multiplies itself in this reaction; it can only act unaided upon silver by generating nitric oxide, yet no nitric oxide is produced; nitric acid in contact with silver stands by inactive, whilst the silver and nitrous acid interact to form nitrite and nitric oxide, and only then develops activity, in order to convert this nitrite and nitric oxide, as well as some of itself, into nitrous acid again. It is true that a catalyser must be assumed to pass backwards and forwards from the state of one substance to that of another, but, then, in so doing, the catalyser neither increases nor diminishes in quantity; it is to all appearance inactive and unchanged. When silver is dissolving, the nitrate and nitrite formed are together equivalent to the nitric acid consumed, nitrous acid, the catalyser, contributing nothing to the accumulating quantity of nitrite.

What change, if any, silver or mercury would effect upon an aqueous solution of nitrous acid free from nitric acid is as yet unknown. Dr. Veley, indeed, before a meeting of this Section, performed experiments upon metals, in which he used three solutions, one of them described and shown as a solution of nitrous acid prepared from silver nitrite, another being nitric acid, and the third a mixture of nitric acid with the solution of nitrous acid, and employed words in describing them which seem to have implied that only the last was a mixture of the two acids. Also, in his memoir on the same subject, published in the *Philosophical Transactions*, and in the abstract of it in the *Proceedings* of the Royal Society, similar language was employed by him; the two solutions being there contrasted as the "water-nitrous acid" solution and the "nitric-nitrous acid"

solution. Nevertheless, he did not mean to imply that the water-nitrous acid solution contained no nitric acid, for, in a paper on the chemical changes between lead and nitric acid, read before this Section of the Society, he clearly indicates the presence of nitric acid in it. But it must be said that his demonstration and description were very liable to be misunderstood, and to be taken to mean the absence of nitric acid. Since it really was present, and in good quantity too, one fails to see how these experiments and demonstrations serve to establish that nitrous acid by itself in water is very active upon copper and other metals. To show to what extent nitric acid must have been present in his solutions of nitrous acid, one of his experiments may be quoted from the *Philosophical Transactions*, in which, in half an hour, 0.0942 grm. of nitrous acid in 15 c.c. of water dissolved 0.1398 grm. of copper. It is not clear from the text whether nitric oxide escaped, but, if it did, 0.14 grm. of copper would have needed 0.414 grm. of nitrous acid, that is, more than four times as much as was present. The amount of copper dissolved proves that there must have been present, along with the 0.0942 grm. of nitrous acid, at least 0.48 grm. of nitric acid, and more than that, if all the copper was in the solution as nitrate. Dr. Veley found that, when much more nitric acid was added, the metal became much less active. The reason for this was not clear to him, nor is it so to the author; but this is a matter of secondary importance here, the point of interest in connection with the present paper being that, in any of Veley's experiments, much more nitric acid was present than the quantity equivalent to the nitrous acid in the solution. In an experiment with lead, and the only one in which the amount of nitric acid present is given, Veley found the metal very active, when the ratio of nitric acid to nitrous acid was less than that of two molecules to one (2.5:1 by weight). Could he have experimented with a still less proportion of nitric acid, doubtless he would have found molecular proportions of the two acids to be the most active mixture of all.

The Primary Products of the action of Zinc or Tin upon Nitric Acid. Nitrous Acid, or a Nitrite not a Primary Product.—When zinc acts upon nitric acid, not nitrate and nitrite or nitrous acid are the primary products, but nitrate and either hydroxylamine, or ammonia, or nitrous oxide, or nitrogen, or, rather, all these together, but independently and each associated only with the nitrate. If zinc is left in nitric acid, there is undoubtedly a production of nitrite or nitrous acid, which may at last be considerable, but only as a secondary product. Zinc acts freely upon its own nitrate in aqueous solution, the products being hydroxide and nitrite. Therefore, only in proportion as nitrate increases in quantity and, before all, nitric acid decreases in quantity, does nitrite or nitrous acid make its appearance. Just at first, only the most delicate tests can detect its presence in the solution, and for some time after, when already the true primary products have been copiously formed, its amount is still very small. All this was fully stated in the author's first paper, but Dr. Veley misconstrued the meaning of what was there said, and was at some pains to demonstrate at the meeting of this Section in 1891 (this J., 10, 204) already referred to, that zinc acting upon nitric acid produces enough nitrous acid to respond to the metaphenylenediamine test. By this demonstration he refuted nothing that the author had said, but showed, perhaps, that to say that only traces of nitrous acid are produced at first, traces sometimes doubtful to find (J. Chem. Soc., 43, pp. 450 and 458), was a slight exaggeration, when judged by the metaphenylenediamine test. But Dr. Veley's statement, that, according to Dr. Divers' experiments, zinc does not yield an appreciable quantity of nitrous acid when it dissolves in nitric acid, is one that cannot be accounted for, since, in that paper, the author records that he even went so far as to try to estimate the amount of nitrous acid produced. Besides, it should be clear from the paper that the author's statements referred almost exclusively to the action of zinc upon nitric acid in presence of sulphuric or hydrochloric acid. Veley quotes Prof. Armstrong as stating (1883) that he finds that the primary product of the reaction of nitric acid is nitrous acid, and that this body is invariably formed when any metal is dissolved in nitric acid. He then goes

on to say that his own results show that all metals dissolve in nitric acid to form nitrous acid as the primary product of the reaction. In reply to this, the author would point out that what Armstrong did state was that he had satisfied himself by experiment that N_2O is produced during the dissolution of metals in nitric acid by the reaction formulated by Dr. Divers, and that, concerning the primary product of the reduction of nitric acid being nitrous acid, his statement only was that he believed there was no doubt of it, which is another thing than saying that he had found it to be the primary product. Veley's published experiments evidently do not prove that nitrous acid is the primary product of the reaction of zinc upon nitric acid, as has been already explained. It has never been denied that nitrous acid is produced, but it has been pointed out that, since it only becomes present in quantity with the using up of the nitric acid, and in the absence of another acid, the conclusion must be drawn that all along its occurrence is sufficiently accounted for by the knowledge that it is abundantly formed in the action of zinc upon zinc nitrate in the absence of much nitric acid. If the minute quantity found, at first and for some time after, represents what has escaped reduction, there seems to be no way of accounting for its greatly increasing quantity much later on, notwithstanding the presence of a superabundance of the metal. If nitrous acid be less stable than nitric acid in contact with zinc, then it should be impossible for zinc to produce it, since it could no more exist in contact with zinc than could nitric acid itself.

Hypothetical Analysis of the Action of Zinc or Tin upon Nitric Acid. "Nascent" Hydrogen.—The presentation, to oneself or to others, of the process of reduction of nitric acid to hydroxylamine, or to ammonia, or to nitrous oxide, or to nitrogen, as occurring in a succession of changes, is proper and valuable as a mental analysis of the phenomenon, but such a presentation must not be taken to be that of reality, unless the facts seem to justify and call for this assumption. In such an analysis we come, in two stages, to N^+OH , and then see that each of several events must happen, $N^+OH + 2H = H_2NOH$, or $= HN' + H_2O$; or, else, $N^+OH + N^+OH = N'''_2O + H_2O$. In these ways, the independent production of hydroxylamine and of nitrous oxide is accounted for. Nitrogen monohydride, N^+H , becomes ammonia by further hydrogenisation. Nitrogen hydroxide, suffering at once both reduction and condensation, $2N^+OH + 2H = N'''_2 + 2H_2O$, will in that way yield nitrogen. That is probably a correct conception of the process of reduction; nevertheless, it is only speculation. The $2H$ is to be understood as an abbreviation for $Zn + 2HNO_3$, what is meaninglessly called "nascent" hydrogen, made into an entity, and then endowed with activity varying in kind and degree, according to what else is substituted for the zinc.

The Production of Hydroxylamine when a Second Acid is present.—The production of hydroxylamine in the reduction of nitric acid is hardly observable, except in presence of either sulphuric or hydrochloric acid in excess, when nearly half the nitric acid may be converted into this substance. A sufficient explanation of the mode of operation of the second acid is found in its action, simply as an acid, by which, for one thing, all the nitric acid is presented as such to the zinc for reduction, instead of much of it being left as nitrate, and by which, for another thing, the hydroxylamine is rendered stable as sulphate or hydrochloride in contact with zinc and acid. It seems probable that the second acid may, by acting as such, tend also to prevent nitrogen hydroxide, which presumably would be feebly basic, from suffering condensation into nitrous oxide and water. That the second acid, along with zinc, acts as a hydrogenising agent is improbable and not borne out by observation. St. Claire Deville was also of this opinion. For example, sulphuric acid is very effective in bringing about the production of hydroxylamine, yet it is very much less acted upon by zinc than is nitric acid, and can hardly take its place, therefore, in supplying hydrogen. If it did so, then with nitric acid in excess in contact with the zinc, and in presence of sulphuric acid, no hydrogen from the latter should be set free, if it were really active, yet, as a matter of fact, hydrogen does escape. Further, since nitric acid, unaided, is reduced to nitrous oxide and

ammonia, it is hard to believe that sulphuric acid can be wanted to furnish hydrogen.

Ammonia, Nitrogen, Nitrous Oxide, Nitric Oxide, and Nitric Peroxide as Secondary Products.—Since ammonia and nitrous oxide are freely produced, from the first, when zinc acts upon nitric acid, there seems to be no reason to believe them to be not primary products. But that they are also, to some extent, secondary products is certain. In the absence of much free acid, hydroxylamine salts are reduced by zinc to ammonia. So is zinc nitrite. *Nitrous Oxide* may arise from the interaction of hydroxylamine with nitrous acid, provided that one of these substances is formed at a later stage and thus finds the other present, but they can hardly be supposed to be produced together, only to become nitrous oxide and water. The same is true as regards *Nitrogen* being derived from nitrous acid and ammonia. *Nitric Peroxide* and *Nitric Oxide* are undoubtedly secondary products, being derived from the decomposition of nitrous acid by nitric acid and by water respectively.

Hyponitrous Acid.—Hyponitrous acid is never found as a product of the action of zinc or tin upon nitric acid. It is only produced as a salt by the action of an alkali metal upon its nitrate, which then in definite stages becomes nitrite and hyponitrite. But in this case, hydroxylamine and nitrous oxide are produced, and, as a secondary product, ammonia. (Trans. Chem. Soc., 1899, 75, 87.)

DISCUSSION.

Prof. RAY said that a considerable quantity of nitrous oxide was produced when copper dissolved in nitric acid. Nitrogen and nitrous acid were also formed. In Dr. Veley's experiments on the action of nitric acid upon metals, a ball of copper had been kept rotating in the acid, so that the products of the reaction should be removed as soon as possible from the field of action at the surface of the metal. But in the usual preparation of nitric oxide by the action of copper on nitric acid, he had often noticed, when the Woulff's bottle had been left undisturbed, that the solution next the copper became of a deep green colour—a fact which seems to show that nitrite, as well as nitrate, was being produced. Copper nitrite had not yet been isolated, and probably never would be. The apparent production of copper nitrite indirectly confirmed the results obtained by the action of nitric acid on silver and mercury.

Dr. VELEY said that if nitric acid had been purified by fractional distillation and finally brought over by some process analogous to the Carré still (the method adopted by Kohrausch and Heydweiler for the purification of water), few metals were acted upon by it. Indeed, he looked forward to the time when an experimenter would obtain nitric acid of such purity, and a metal—sodium—also of such degree of purity, that, working under suitable conditions, the metal sodium would float peaceably on the nitric acid. They were brought face to face with the problem as to why did the reaction ever commence. Supposing it had begun, and supposing the conditions were such that there was formed some small quantity of nitrous acid, then the reaction would proceed rapidly and the equations represented on the board might or might not be accurate representations of the real facts. With regard to Dr. Divers' statements as to the action of zinc on nitric acid, he would like to say that he had, himself, not worked sufficiently on the subject to be able to express an opinion; all that he had desired to prove (by his demonstration on a former occasion) had been that, if the conditions were such that the zinc dissolved in the nitric acid, nitrous acid was formed. With regard to the experiments, concerning which Dr. Divers had cited certain numbers, he should explain that, of course, nitric acid was present in both the nitrous acid mixture and in what he had called the nitrous-nitric acid mixture. The object of the experiments had been to show that, instead of nitric acid facilitating the reaction between the acid liquid and the metal, it impeded it; the nitric acid present was a something in the way, and therefore he had argued, perhaps incorrectly, that the so-called nitrous acid, and not nitric acid, was the real substance which reacted with the metal. He hesitated to term certain of

the equations (those in column 2, page 1184) put forward by Dr. Divers even working hypotheses.

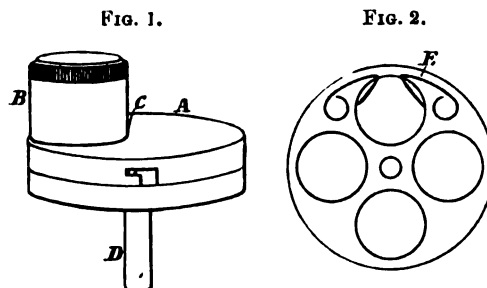
Dr. DIVERS, in reply, said that he had been gratified by hearing Dr. Veley refer to nitrous acid as a substance of uncertain, shadowy existence, because in 1891 Dr. Veley had brought it against him that he had spoken of it in much the same way, in a paper published in 1885. It was important to have had it cleared up that Dr. Veley's experiments with nitrous acid and metals had established the fact that, in very dilute aqueous solutions, a mixture of nitrous acid with little more than its equivalent of nitric acid was very active upon metals, for that was quite in accordance with the view set forth in the paper as to the combined action of the acids, $\text{NO}_2\text{H} + \text{HO}\cdot\text{NO}_2 + 2\text{Ag} = 2\text{AgNO}_2 + \text{H}_2\text{O}$. Further, that somewhat more nitric acid greatly impeded that action, although, with much more of it present, it itself became very active, with the nitrous acid as catalyser.

*LUMINESCOPE FOR COMPARING SUBSTANCES UNDER THE INFLUENCE OF RADIUM RAYS.

BY C. S. STANFORD WEBSTER, F.I.C.

The value of the method adopted in the pocket spinthariscopes of Sir William Crookes, for observing the scintillating effects produced by the radium rays on sulphide of zinc, has become so generally recognised that a further extension of the method, with the object of rendering it applicable for comparing different substances, both as regards "glow" as well as scintillating power, appears desirable. It is to meet this want that the luminescope has been designed.

The instrument consists of a light circular metal box A (Fig. 1) perforated in the lid where the cylindrical piece B



Scale = half actual size.

is attached, carrying the draw tube with the system of lenses, the latter in a similar manner to the spinthariscopes, except that the pointer, with the radium salt beneath the ocular, is fixed to the inside of the lid, about the position C. The box contains a circular metal disc, shown in plan (Fig. 2) resting on leather, and having a short tube or rod fixed to the centre, which passes loosely through the bottom of the box, thus forming both the axle and the handle D. The disc is kept in place by a flange of leather, which presses on its edge, and is fixed to the lining of the box. The lid of the box is conveniently fastened by the adoption of bayonet joints. By turning the handle D, the disc is made to rotate, bringing the screens into position under the pointer as required. The disc carries four screens, one of which is temporarily fixed by means of the wire spring clips E, and can be removed at will and any other screen of a finely divided substance substituted for comparing the scintillating power, or, in the case of mounted fragments of minerals, &c., for observing the comparative glow.

To obtain the best results with the instrument, the various substances should not all be placed at the same distance from the radium salt. A good plan is to give the screens a

* The instrument was originally styled "Fluorescope," but as there is already an instrument termed a "Fluorescope" in existence, used for direct observations with the Röntgen rays, to prevent confusion the name Luminescope is preferred.

foundation of cork—a thick base, for instance, being used under a mounted fragment of diamond, and a thin one under the screen of sulphide of zinc. The diamond is thus brought near the pointer to obtain the maximum glow; the sulphide of zinc being farther away, the scintillations are consequently seen to the greatest advantage. It is hardly necessary to add that the draw tube must be adjusted for each observation.

I cannot conclude the description of this little instrument without acknowledging the advantage which I have had of the friendly criticism of Sir William Crookes.

METHOD FOR THE DETERMINATION OF PHOSPHORUS IN IRON ORES.

BY J. S. ROWLAND, F.I.C., AND LLEWELLYN J. DAVIES, F.C.S.

The importance of estimating the percentage of phosphorus in iron ores intended for the manufacture of steel, more especially those used in the acid process, is perhaps more necessary at present than formerly, owing to the fact that the low phosphoric ores are becoming more difficult to obtain. Works chemists generally are obliged to keep a watchful eye on all cargoes in order to prevent unsuitable ores going into the blast furnace.

The ordinary molybdate and magnesium methods are quite accurate for all purposes if carefully conducted, but they take a considerable amount of time, and for low percentages of phosphorus require a fairly large bulk of material. Oxidation has to be done with concentrated acids and these evaporated, the residue taken to dryness, and again taken up with acid, washed, &c., which all require attention.

In order to economise labour and save time, we have devised a method which has, in our hands, worked satisfactorily, and given results which agree amongst themselves, and also agree, within allowable margin of error, with those obtained by other analysts on joint samples taken from cargoes of ore.

The chief points of the method are as follows:—

(a) The ore is oxidised by incineration with magnesia and then boiled with dilute nitric acid. A solution is thus obtained which contains all the phosphorus, and saves the evaporation and reduction necessary in the other processes.

(b) The determination of the phosphorus by titration of the yellow precipitate with standard sodium hydrate and nitric acid solutions.

Method.

Mix one or two grams of the finely ground sample of the dry ore with one gram of calcined magnesia (free from phosphorus). This can be done on a piece of glazed paper. Heat the mixture in a porcelain incinerating dish (3 in. by 1 in. by $\frac{1}{2}$ in.) at a bright red heat for one hour in a muffle furnace. Allow the dish to cool and then transfer the mixture into a beaker and slowly add about 25 c.c. of 50 per cent. nitric acid and boil for 10 minutes. Allow to settle and decant the clear liquid into a Erlenmeyer flask of 12 oz. capacity, using a good filter paper; add about 25 c.c. of water to the residue in the beaker, boil for five minutes, and filter into the flask and wash till free from acid. All the phosphorus is now in solution.

Add 5 c.c. of ammonia and heat up the solution to boiling, add 50 c.c. of molybdate solution, and wrap in towel, after inserting rubber stopper (or put in shaking box), and shake for 10 minutes. Filter immediately, using a good paper and moderate suction, wash out the flask on to the filter paper five times with 1 per cent. nitric acid solution and also five times with 1/10th per cent. potassium nitrate wash (1 gram. per litre), and wash filter till free from acid. Place the filter paper and contents in the flask, add from 10 to 20 c.c. of standard sodium hydrate solution and shake a moment until the yellow precipitate is dissolved. Dilute with water to about 50 c.c., add three drops of phenolphthalein solution, and titrate with standard nitric acid solution until the pink colour disappears. The cubic centimetres of standard sodium hydrate solution used in dissolving the yellow precipitate represents the hundredths per cent. of phosphorus in the sample analysed when 1 gram. is taken for analysis.

Sodium carbonate can be used in the place of magnesia, but we have found that the latter is more convenient, owing to its infusibility.

In the above method the molybdate precipitate is treated with slight modifications according to the directions given in "A Rapid Method for Phosphorus Determination in Iron, Steel, and Ores," by James O. Handy, in the Amer. J. Analytical and Applied Chemistry, 1892.

Reagents.

Molybdate Solution (E. F. Woods 1888 Formula).—One quarter pound of molybdic acid is mixed with 300 c.c. of water in a stone jar; 175 c.c. of ammonia (0.90 sp. gr.) is stirred in and the stirring continued until all the matter is dissolved; 75 c.c. of concentrated nitric acid (1.42 sp. gr.) is added to partially neutralise the ammonia solution.

In a $\frac{3}{4}$ litre bottle is placed 500 c.c. of nitric acid (1.42 sp. gr.) and 1,200 c.c. of water. Pour the molybdate solution into the bottle and mix with a rotary motion. If the stream of molybdate flows quickly and continuously into the acid mixture no separation of molybdic acid takes place. Both solutions may be hot when mixed.

Pure Yellow Precipitate.—This can be prepared from acidified ammonia or sodium phosphate by precipitating with molybdate solution. Wash the precipitate with 1 per cent. nitric acid wash. Dry at 100° C. Keep in a glass-stoppered bottle for use.

Standard Sodium Hydrate.—7.2 grms. of sodium hydrate are dissolved in 100 c.c. of water. Saturated barium hydrate solution is stirred into the sodium hydrate solution until no further precipitation occurs. It is filtered at once and made up to 2 litres with distilled water.

Standard Nitric Acid.—10 c.c. of nitric acid (1.42 sp. gr.) is made up to 2 litres with distilled water.

Standardising Solutions.—Run the standard acid and alkali against each other, and having ascertained their relative strengths add sufficient water to the stronger to make the solutions equal in value. Next run the sodium hydrate solution against 0.100 gram. pure yellow precipitate which equals 0.00163 gram. of phosphorus. If its strength is too great (e.g., if 1 c.c. equals 0.000106 gram. of phosphorus) add to the 2 litres of standard sodium hydrate 60 c.c. of water. In order to preserve the equality of the acid and alkali solutions, add to the 2 litres of standard nitric acid 60 c.c. of water and mix. The solutions will then be equal, and 1 c.c. equals 0.0001 gram. of phosphorus.

Phenolphthalein Indicator.—0.5 gram. of phenolphthalein are dissolved in 200 c.c. of 95 per cent. alcohol. Three drops are used for each titration.

Table of Results.

Description of Ores.	Gravimetric Result.	New Method Results.	
	P.	P.	P.
	Per Cent.	Per Cent.	Per Cent.
Calcined spathic	0.0085	0.01005	0.00905
Magnetic	0.01887	0.01925	0.01853
Hematite*	0.0190	0.0191	0.0191
" red	0.034	0.0361	0.0361
Miraculous	0.0534	0.0516	0.0521
	0.2000	0.1995	0.1995

* This sample contains 0.009 per cent. of arsenic.

Discussion.

Mr. SPILLER referred to a paper he read entitled "The Estimation of Phosphorus in Iron and Steel" (J. Chem. Soc., 1866, 19, 148), which was equally applicable to the examination of iron ores, and described how he would treat a spathic ore or clay ironstone. He never went to the length of being able to apply a volumetric process to the method as the authors had done. It was only an everyday method of getting a result which was undoubtedly accurate, and he had heard of its being used in later times.

Mr. GRANT HOOPEE asked if Mr. Davies would state the object of igniting the ore with magnesia, and whether,

apart from the question of the possible presence of a trace of silica, there was any reason why the molybdate precipitate should not be strictly weighed on a Gooch crucible. He further asked whether on the solution of the molybdate precipitate, with the object of removing any silica that might be present the author had any experience of the process by which the molybdate was then precipitated and weighed as lead molybdate. This process was far more rapid than the ordinary one, and he had found it very useful, though, where a large number of analyses were being made, he could understand that a titration was more rapid.

Mr. DAVIES, in reply, said, with regard to the condition of the phosphorus in the incinerated residue, that the magnesia in combination with oxygen from the air oxidised all the phosphorus into a form of magnesium phosphate. They had not tested in which form it was in the incinerated residue. In answer to the question of the effect of any silica in the weighing or titrating of the yellow precipitate, he would point out that the yellow precipitate was not weighed in the above process. Any silica that might be present during the process did not appear to affect the results obtained by titrating the yellow precipitate. They always filtered the molybdate solution before use. They had no practical knowledge of the lead method. By the method he had described they could get a result, allowing five minutes for weighing, in 45 minutes. Of course, they did not count the hour for burning, because once the ore was placed in the furnace it required no further attention until roasted, and other work could be done. They knew of no other process for the estimation of phosphorus that could be completed in so short a time, and they had found the results very accurate.

New York Section.

*Meeting held at the Chemists' Club, on Friday,
October 21st, 1904.*

MR. RUSSELL W. MOORE IN THE CHAIR.

PRESENT METHODS OF TANNIN ANALYSIS AND THEIR INFLUENCE ON THE MANUFACTURE OF LEATHER.

BY JOHN R. MARDICK.

The introduction of extract tannins into American tanneries is a new feature and requires very careful mechanical attention in order to make good leather. It is our duty as chemists to exercise a scientific supervision over chemical processes in tannery practice, to manufacture extracts of good quality and to show, by careful analyses, that these extracts contain the true percentage of those tannins which actually combine with hide fibre.

The present methods of tannin analysis are all empirical. The tannins do not form a definite chemical compound with the hide matter; in fact, the absorption of tannins by hide is mostly a physical phenomenon, very closely related to osmosis. Originally, these empirical methods were devised for the benefit of the tanner; now the tanner is only a small factor in tannin analysis. Researches on tannin analysis have now so little direct bearing on the manufacture of leather that they may be said to be made altogether from the standpoint of the extract manufacturer. We know now how much tannin there is in an extract, and we leave the tanner to find out how much leather can be made from that extract.

The tannins reported on paper differ from those of the yard, because the conditions under which the tannins are analysed differ from those of the tannery. For instance, the tannin determinations in the laboratory are made in very weak solutions, containing 3 grms. of tannin to a

litre, while most yard liquors are several times stronger than that amount. The result is that while reds and non-tannins go into solution under the conditions of laboratory analysis, to be subsequently taken up by the spongy hide powder and thus raise the percentage of tannins in the report, the same reds and non-tannins remain in the yard as insoluble and are thus not absorbed by the hide. Again, the temperature of a yard in normal conditions runs between 45°—75° F., while the analysis is made between 68°—100° F. Because in the analytical work the concentration of solutions, the temperature and quantity of hide powder differ from tannery conditions, so the percentage of tannins do not agree at all. In the laboratory 15 grms. of hide powder (45 grms. wet) is violently shaken with a solution containing 1 gm. solid, out of which 6 grms. is tannin. Naturally, this large quantity of hide powder absorbs not only the tannins, but also a part of non-tannins, such as gallic acid and soluble matters introduced into the extract for the purpose of preventing the precipitation of reds in the liquid extracts. All this absorbed matter is reported as tannin. Consequently, the tanners cannot make leather to correspond with the percentage of tannins found by the chemist. If methods of tannin analysis are to be empirical and made for the advancement of the leather industry, the conditions of analysis ought to correspond with actual tannery practice.

Tanning in vats involves a loss of 15 per cent. of tannin, while in modern quick tannage the loss is only 5 per cent. Why should there be such an enormous loss in tannins when the entire mechanical loss amounts to only 3—4 per cent.? A definite quantity of an extract, dissolved in a measured vat and made up to 10° bark liquor and allowed to stand for four days, then analysed according to the American official method, without heating the liquor, but simply diluting, would not give the original percentage of tannins, but the reds and non-tannins are increased. By the official method of analysis only 5—6 grms. of solid matter is dissolved in a litre, and accordingly reds and non-tannins go into solution. In analysis much of the reds and non-tannins is absorbed by the hide powder; hence the high results. In modern quick tannage, where the extracts are heated to 100°—125° F., and then applied in a wheel to the partially-tanned skins, the loss is small, because some of the reds and non-tannins are incorporated with the hide. We cannot apply, however, this temperature to the green stock or the liquors in the vats.

There are two definitions of tannin. According to the extract manufacturer it is any vegetable principle that can be absorbed by hide powder at laboratory temperature and concentration. According to the tanner it is any bark or other astringent liquor that combines with the fibre under the normal conditions of the tannery and forms leather. Do all the tannins reported in analysis really go to make leather? Since some of the non-tannins, gallic acid and reds in these extracts are calculated as tannins, and sold as such, the tanners have always failed to secure results commensurate with the amount of extract used. For example, 100 lb. of 25 per cent. extract, which should make 60 lb. of sole leather (taking oil and moisture into consideration), in actual practice hardly makes 50 pounds, even under the most favourable conditions. This discrepancy led us to investigate the subject, and we have come to the conclusion that extracts contain from 1 per cent. to 5 per cent. less tannin than is guaranteed.

A 5° barkometer liquor was prepared from a chestnut extract, and 100 c.c. of this were treated by the maceration method with 20 grms. (containing 75 per cent. of moisture) of wet hide powder, stirred thoroughly, and large particles on the side of the glass crushed with a spatula. In 15 minutes the hide powder had absorbed all the available tannins that make leather. The clear filtrate was tested with 1 per cent. of gelatine and 10 per cent. of salt solution (this solution being accurate to 0.005 per cent). No tannin reaction could be obtained. Another 100 c.c. of the same liquor treated with 20 grms. of hide powder, shaken for 10 minutes in a milk shaker, and analysed according to the official method, gave from 0.75 per cent. to 1 per cent. more tannins than the former. Since there was no tannin in the filtrate from the maceration method the excess given by the latter method must be something else than tannins.

Again, six solutions of the same strength were macerated respectively with 20 grms. of hide powder, for $\frac{1}{2}$, $\frac{1}{4}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, and 2 hours respectively. The absorption of non-tannins in the last five cases increased successively from $\frac{1}{2}$ per cent. to 1 per cent. In the case of solid extracts the difference was from 1.5 per cent. to 3 per cent. The following were analysed by the maceration method:—

	Guaranteed.	Found.	Found.
	Per Cent.		
Total solids .....	..	35.00	40.24
Total soluble solids .....	..	33.88	39.77
Non-tannins .....	..	9.30	14.23
Tannins	25	24.05	24.56
Insoluble resins .....	..	0.50	1.43

These experiments were repeated with other extracts from different houses. Of these extracts it was found that those guaranteed as 25 per cent. tannin contained 24 per cent., while those guaranteed as 26 per cent. tannin contained not quite 25 per cent.

We think that the maceration method gives more reliable results than the shake method, but the greatest difference arises from the concentration of the solutions or amount of sample taken for analysis, as we have pointed out before. In the following results we have used three times more extract than the usual official amount, and we find that our method comes within 0.25–0.50 per cent. of actual tannery practice.

	Chestnut Extract.		Mixed Extract.	
	Modified Method.	Official Method.	Found.	Guaranteed.
Total solids	40.82	40.92	75.52	79.00
Total soluble solids	36.87	39.00	76.58	79.00
Non-tannins	14.00	15.02	16.03	16.60
Tannins	22.87	23.98	61.55	68.40
Insoluble resins	4.65	1.92	1.94	..

	Quebracho.	
	Modified Method.	Official Method.
Total solids	47.76	47.76
Total soluble solids	39.50	43.53
Non-tannins	8.13	7.97
Tannins	31.57	35.58
Insoluble resins	8.16	4.21

Of all methods of tannin analysis, the official method of the Association of American Official Agricultural Chemists is the simplest and most promising. Recently Parker and Payne have outlined a method by which tannin solutions are titrated with lime, forming an insoluble compound with gallic acid. Again (Zeits. angew. Chem., May 1904), Wislicenus advocated the use of alumina instead of hide powder. The accuracy of these last two methods has not yet been definitely tested, so we may turn our attention to the official method:—

Objections to the American Official Method.—(1) During shaking, the hide powder in some cases goes into solution (this depends on the strength of the solution), and non-tannins are absorbed.

(2) The quantity of material used for analysis (i.e., 3 grms. of tannin for 1000 c.c.), is too little, and the hide powder too much. The result is that more gallic acid and non-tannins are absorbed by the hide powder. The tannin solution ought to contain 10 grms. of tannin per litre.

(3) There is an appreciable error in making the analysis at room temperature. The solution ought to be measured at 20° C., which corresponds to the temperature of the average tannery.

(4) In the chroming of the hide powder, 3 grms. of chrome alum for 100 grms. of hide powder is not sufficient

to make it insoluble. For chroming it is better to use basic chromium, sulphate, or chloride in quantities containing 1 per cent. of chromic oxide (Cr_2O_3) per 100 grms. of hide powder.

F. Kopecky (Collegium, 1904, 211–214) says: “The absorptive power of this hide powder diminishes as it is more highly chromed, but if under chromed, the solubility is greater, especially for acid liquors.”

Hide powder absorbs non-tannins under any circumstances; but we would improve the method of manipulation so that the error from the absorption of non-tannins and gallic acid will be reduced to its lowest limit. We suggest the following improvements in the analysis of tanning materials.

Preparation of Hide Powder.—Digest 100 grms. of hide powder in 1000 c.c. of water for two hours, add 8 grms. of chrome alum, changed previously to chromium basic sulphate by boiling in 50 c.c. of water to 25 c.c. with 1 gm. of soda crystals, after 12 hours squeeze through linen and wash five times with distilled water. In the last washing add 10 c.c. of formaldehyde, and let it stand two hours before squeezing. By a press, get as much water out of it as possible, and use 25 grms. of this hide powder for analysis, and from 1–2 grms. for moisture determination.

Quantity of Material.—For the purpose of analysis the following quantities are recommended:—

Bark.	Grms.	Extracts.	Grms.
Hemlock	50	Chestnut wood	40
Oak bark	50	Quebracho (solid)	15
Oak wood	100	(liquid)	30
Quebracho wood	35	Gambier	20
Sumac	25		
Spent tan	100		
Amazona	25		

After extracting the tannin materials from the above, the solutions might be made up to 1000 c.c., and measured at 20° C.

Total Solids.—Shake the solution thoroughly, and measure out at 20° C. 50 c.c., evaporate in a weighted dish (6 ins. in diameter, 1 in. high), and dry at 102° to 103° C. for three hours.

Soluble Solids.—To 1 gm. of washed kaolin add 5 c.c. of tannin solution, stir until thoroughly mixed, then add 100 c.c. of the same solution, stir and pour on filter (S. and S. No. 590, 15 cm.). Keep the filter full, reject the first 100 c.c. of the filtrate, and evaporate the next 50 c.c. on water bath, and dry at 102° to 103° C. for three hours in the drying oven.

Non-Tannins.—To 25 grms. of hide powder, in a shake glass, add 100 c.c. of tannin solution, stir, and crush with a spatula the large particles on the side of the glass; after it has stood 10 minutes stir one half minute; after 15 minutes further standing stir again, and throw on a double folded cheese cloth; squeeze out as much liquid as possible, filter in same way as in soluble solids, evaporate 50 c.c. on water bath, and then dry at 102° to 103° C. for three hours.

Tannins.—Soluble solids, less corrected non-tannins, give tannins.

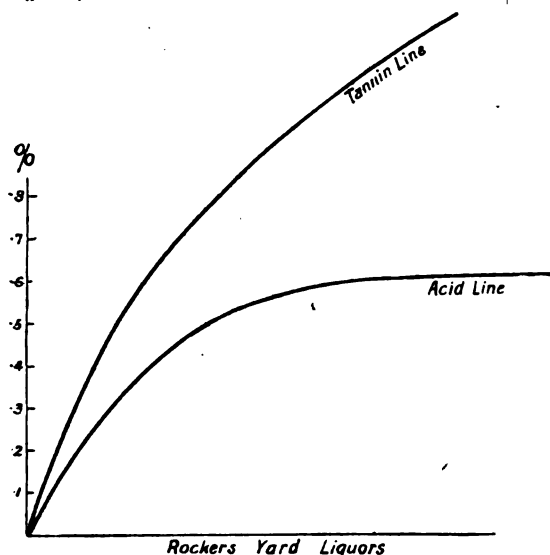
Moisture.—100, less total solids, gives moisture.

Testing Non-Tannin Filtrate.—To 5 c.c. of clear non-tannin filtrate add 5 c.c. of 10 per cent. salt solution in a test tube; add slowly a few drops of 1 per cent. of Nelson's gelatine solution on the side of the test tube. A slight milky cloudiness indicates the presence of tannin.

Precautions.—(a) In all quantitative work of tannin analysis, evaporation during filtration must be guarded against, both in the funnel and in the receiver of the filtrator. (b) After evaporating the solutions on water bath, the dishes which contained the tannin must be dried at from 102° to 103° C. for three hours, and must be weighed only once. (c) In the analysis of gambier, sumac, myrobalans, quebracho, and other sour liquors, let the tannin solution stand with the hide powder for a longer time (about 60 minutes instead of 30), with occasional stirrings.

Acidity in Tan Liquors.—In tanning, the proportion of tannins to the acids in a liquor is of paramount importance, as the success of leather manufacture depends on rightly

adjusting the proportion of these two constituents. Brittle leather is obtained when the tannins are less than twice the amount of acids in the rockers and handlers, and again, when the tannins are less than three times the acids in the sapped liquors. To make this more plain, the acids and tannins rise gradually from the rockers and handlers up to the lay-away liquors, then the acids remain stationary, and the tannins increase up to 3 per cent. to 4 per cent. (See diagram.)



The best results are obtained when there is not more than from 0.5 per cent. to 0.6 per cent. acid in the rockers, while the tannins ought to be more than 1 per cent. in the rockers or handlers.

In leaching the bark, some of the extract manufacturers use alkali salts, which diminish the astringency of liquors, and sodium bisulphite, which checks the production of organic acids by fermentation when the liquors are standing in vats; consequently, they require additional acids to restore the tannins to active conditions. The alkali salts combine with the gallotannic and ellagitannic acids, and form the alkali salts of the same acids. In order to free these acids, fresh quantities of acids are required, and this additional item is a large bill of expense in tannery practice. This explains why certain extracts, which are not apparently alkaline, absorb acetic and lactic acids when added to them.

Acid Analysis.—The analysis of acids in tannin liquors is another important element for serious consideration.

The official method of determining acidity in tan liquors (rockers, handlers, &c.) by decolorising with animal charcoal, and then titrating with alkali (with phenolphthalein as indicator) is slow and faulty. Both animal charcoal and filter paper absorb acid; the decolorisation is not complete without heating the solution with a return condenser; the dark coloration produced by titration with alkali and the carbonic acid in the solution make phenolphthalein less accurate as an indicator, and this interferes with the accuracy of the determination. The following, which already is used on the Continent, and to a certain extent in this country (*Deutsche Gerber-Zeitung*, 1900, No. 45), is suggested as a quick and reliable method for acid determination:—

Take 25 c.c. of tannin solution and titrate with N/10 KOH; add alkali, $\frac{1}{2}$ c.c. at a time, and with a glass rod put a drop of the solution on blue litmus paper; observe the change of colour in the paper; in this way, repeat the testing until the solution produces no change in the shade of the paper (the litmus paper should be very sensitive and of good quality). The solution gradually assumes a dark colour as it is neutralised, and the original intensity of the acid colour produced on the litmus paper decreases correspondingly until it shows no change, and this is the end point. Or still better, the end point might be taken between

the red and blue papers. In this way a determination can be made in from five to ten minutes. This method is accurate to 0.02 per cent.

Nottingham Section.

Meeting held on Wednesday, December 14th, 1904.

MR. S. F. BURFORD IN THE CHAIR.

NOTES ON GLUE AND GLUE TESTING.

BY H. J. WATSON.

Originally it was intended that these notes should deal exclusively with the analysis of glue, but in view of the many sources from which glue is obtained, and the different methods employed in treating the raw material, it has been thought essential to the proper grouping of experimental results to classify the samples, in the first place to the sources of material, and in the second to their order of derivation. Upon the quality of glue desired depends the material and process a manufacturer will adopt.

In the first place under glues, we have skin, bone, and fish glues, and again under gelatines, skin, bone, and fish gelatines, these being subdivided according to method of treatment and order of derivation. In the first group under the subdivision, I place what I term osseine glues, being those glues which are produced by the reduction, fully or partially, of the material to a form of osseine. The term is one well known in the trade, there being in existence some factories wholly engaged in its production. From osseine thus prepared, high-class colourless glues and gelatines are manufactured. In the production of this class of glues and gelatines the preparation of the material has been carried to the highest pitch of perfection known, and the extractive period under heat has been reduced to the shortest possible, probably not more than two hours. We may assume, for all practical purposes, that this is an ideal standard. The samples, however, produced from one osseine material may represent 13 or 14 grades, all of successively lower qualities and representing in each case successive stages of extraction, each of increasing duration under heat. With regard to skin glues under this group there is a deviation in grades according to the requirements of the factory. In any case the first extractive quality will not amount to more than 25 to 30 per cent. of the total product.

In the second group I designate original glues, in that they are composed of 60 per cent. of the material contents of gelatine, and contain the total practicable extractive value of the material. Skin and bone glues come under this group.

In the third group I designate reinforced glues, and include in this class those samples which are prepared from the lower grades of the osseine glues, blended with a certain proportion of original extractive gelatine from lower classes of material.

In the fourth group I designate average glues. I place those samples which are prepared on a continuous system in which the later extraction results are passed into fresh material, and which, therefore, contains a result from a number of extractions of the same material in different stages of exhaustion.

In the fifth group I place successive glues, inclusive of these glues, which, although produced on a system similar to the third group, are reinforced from the same class of material. This grouping does not by any means exhaust the variations in these products. Under each group-heading there will be found a number of minor modifications due to special blends of materials operated upon, the particular market catered for, and also to some extent upon the individual caprice and inherited traditions of a manufacturer.

In French glues the majority may be placed under groups No. 1 (osseine) and No. 3 (reinforced). In Germany and Austria the bone glues are principally group No. 4 (average), the skin glues group No. 2 (original). The foregoing applies to the bulk, but all the groups are individually represented in each country. I would, however, emphasise the fact that there is no standard method in the manufacture of glue as in the case of, say, alkali or other well-known industrial products, and, therefore, the utter failure up to the present to set up some effective standard of valuation of glue is not difficult to understand. In my opinion this failure is due in no small measure to the absence of any attempt to apply different physical tests to samples from the different groups.

Analysis.—Practically the valuation of glue by analysis to the manufacturer is one thing and to the consumer quite another. It must be borne in mind that it is to the consumer that the ultimate decision is valuable, and chemical analysis not giving him any appreciable data of service, reliance is placed almost wholly on one or more of the many physical tests invented. I may here say that the four principal points of value to the consumer are: (1) adhesiveness; (2) strength or cohesion; (3) rate of setting; (4) carrying power or medium absorption. Adhesiveness is best shown by viscosity; strength or cohesion, by consistency jelly test; rate of setting, time taken to coagulate. Of course it is impossible to generalise in this matter, as the special value to one consumer is quite a different physical property to another. As an example of what is required by a consumer, one of our customers specifies that the glue shall be submitted to the following tests:—(1) Percentage of water in original glue at 110°–115° C.; (2) percentage of ash and quality; (3) acidity (total and volatile); (4) capacity for drying; (5) percentage of foreign matters not glue; (6) viscosity, along with the physical test of smell of glue size with water absorption, &c.

The principal physical and chemical tests applied to glue were enumerated at the first meeting of this Section by Messrs. Trotman and Hackford, and will be found in the Journal for November 30th.

After numerous experiments with the various methods of glue testing, I place most reliance upon the consistency test, described by Messrs. Trotman and Hackford, and Fels' viscosity test. From personal experience I can affirm that the consistency test does not depend upon individual idiosyncrasy, and that a short experience only is necessary to enable one to obtain reliable comparative results which have been found to be of great value in the manufacture of glue. The only objection to the general adoption of this test is in the selection of a standard glue which would have to be the standard of both manufacturers and consumers alike. I have found in many cases it is quite necessary, in addition to the consistency test, to know the viscosity of the glue under examination. For this test I use Fels' method with an Angler's viscometer. In the Journal 1901, page 139, Fels recommends in the application of his test that the temperature be raised from his originally prescribed one of 30° C. to 35° C., because he had met with a glue whose viscosity was 6.24, while the highest limit permissible is 4. Even at this higher temperature I have met with a number of samples which have viscosities higher than 4, one sample showing a higher viscosity than 11. It would appear therefore that a weaker solution ought to be recommended. I am aware that Rideal uses a 1 per cent. solution at 18° C., but I prefer a stronger solution.

Coming now to chemical analysis and excluding moisture, ash, acidity, and the saponification process, the only other constituent which any attempt has been made to determine is nitrogen, and by multiplying by a factor to obtain gelatin. It will perhaps be better to here explain that I prefer to adopt the recommendation of Rideal, and when speaking of the pure substance to spell it *gelatin* and the commercial article *gelatine*. It is generally accepted that the manufacture of glue or gelatine is one of hydrolysis. Collagen, the substance in osseine, which forms the principal basis of all glues and gelatines, is capable of undergoing several stages of hydrolysis, first into *gelatin*, then into *gelatines* (analogous to albumoses), next into *gelatones* (analogous to peptones), and finally into amido acids. In the process of manufacture

the whole of these reactions must take place to a more or less extent, according to duration of the process under heat. It follows, therefore, that these compounds must all be present in commercial glue or gelatine. Besides these substances there must be in the commercial product, according to the source of material and selection and treatment of same, previous to boiling, other nitrogenous bodies, as chondrin, which has gelatinising properties, mucin, albumoses, and other complex nitrogenous compounds. Messrs. Trotman and Hackford, in the paper already referred to, attempt to differentiate between the different forms of nitrogen in glue by using Bömer's method for albumoses. An attempt is made to compare the consistency jelly test with the nitrogen precipitated by zinc sulphate, and which they term albumose nitrogen. In my opinion, any attempt to place a valuation on glue by simply estimating either the total nitrogen or the nitrogen precipitated by zinc sulphate is useless. In the first place, in the total nitrogen is represented all the hydrolysed compounds of collagen and chondrin, and other complex nitrogenous compounds. In the second place, the precipitate by zinc sulphate is of uncertain composition, because it may contain gelatin, gelatones, and possibly chondrin; by multiplying the nitrogen found by the factor used by Allen, 5.42, we get gelatin, whether the precipitate is gelatin or gelatone. Messrs. Trotman and Hackford use the terms albumose nitrogen and peptone nitrogen. I make objection to the use of these terms to differentiate between gelatin and nitrogenous compounds not gelatin, because they are somewhat out of place when dealing with gelatin, and because the real albumose can only be a negligible quantity. If there is to be any attempt to differentiate, we ought to keep to the terms used to distinguish the different stages of hydrolysis. Albumin, albumoses, and peptones should only be used for that special group of proteins. A notable point in Messrs. Trotman and Hackford's paper is that the difference between the total nitrogen and the nitrogen precipitated by zinc sulphate can only be due to over boiling. While admitting that over boiling does to some extent destroy the gelatinising properties of glue previous to drying, the adhesive qualities are not impaired in proportional extent, if at all. The points raised by the authors already referred to are of immense interest to the manufacturer and consumer alike: to the manufacturer perhaps more so, because, if, as they state, he is losing gelatin to the extent of 1 to 15 per cent., as shown in their table, it is a serious loss which ought to be easily overcome and at the same time add to the commercial value of his glue. On account of its great importance a number of samples of commercial glue from known sources were selected and examined by the consistency jelly test, Fels' viscosity test at 35° C., total nitrogen and nitrogen by zinc sulphate. With the explanation of grouping given in the opening part of these notes and the table here set out, it will be seen that selection of material and mode of treating same before boiling are the leading factors in the differences shown between the two nitrogen tests. It will be noticed on comparing the consistency test with the viscosity test in every case they are not analogous. I mean the viscosity does not always rise and fall with the consistency. This shows the necessity for having the two methods, and is accounted for from the fact that gelatin and gelatones have not the same gelatinising properties, therefore a method which precipitates and treats both as one for calculation cannot be regarded as a method upon which reliance can be made in valuing glue or gelatine. In the table here given, Nos. 1, 2, 3, and 4, go through almost precisely the same boiling period, and the only difference is a selection of material. No. 1 is a very inferior material, and undergoes little or no treatment prior to boiling. No. 5 is a glue which undergoes the longest period of boiling, and is what is known as a medal glue. No. 6 is a celebrated Scotch grade noted for its adhesive properties, but, according to zinc sulphate test, is not greatly superior to No. 1. No. 11 certainly shows the least difference in the nitrogen tests, but has much less gelatin, according to the zinc sulphate test, than some of the much inferior grades. I have not given an osseine glue in my table, but No. 1 in Messrs. Trotman and Hackford's table is a very good example of a bone osseine glue or gelatine.

No. 1.	Viscosity of 15 per cent. solution at 33° C. Water = 1.	Consistency Test.	Jelly Test.	Total Nitrogen x 5.43 = Gelatin by Kjeldahl.	Nitrogen precipitated by ZnSO ₄ and Kjeldahl x 5.43 = Gelatin.	Difference between Gelatin by Total N and Gelatin by Zn SO ₄ .
2 } Average glue bone	1.44	53	78.26	58.53	19.73	
3 }	2.07	108	79.56	72.19	7.37	
4 }	2.01	108	78.26	72.19	6.07	
5 }	1.96	123	81.08	70.13	10.95	
6 } Reinforced glue bone.	1.61	53	76.5	65.25	11.28	
7 }	1.81	100	74.36	61.89	12.47	
8 }	2.45	156	75.55	71.97	3.58	
9 } Successive glue	1.94	130	74.14	72.52	1.62	
10 }	4.91	250	78.26	75.88	2.38	
11 } Original glue skin.	3.68	219	78.26	77.18	1.08	
	11.53	323	73.71	72.84	0.87	

In conclusion, it appears to me to be entirely impossible, in the absence of further research and improved methods of distinguishing between hydrolysed forms of collagen, to attempt to place any valuation upon glue or gelatin by chemical methods. The action of heat is different from peptonisation by bacteria, and, although it tends to lessen gelatinising properties, it does not decrease the adhesive properties. Rideal states, after elaborate experiments, that after 12 hours' heating, all the prominent physical properties of value decline, while the chemical reactions are little altered.

DISCUSSION.

Mr. S. R. TROTMAN said that the author's admission of the absence of a standard method of manufacture appeared to be the same thing as admitting a want of control of the different processes, while recognising that a glue might be spoilt by over boiling. These points seemed to point to the value of the method, proposed by himself and Mr. Hackford, at the last meeting of the Section, as a means of differentiating between the different forms of nitrogen and controlling the different processes. If, for instance, the zinc sulphate determination were made on the liquor as at first extracted, any decrease in this figure during the subsequent operations would undoubtedly point to peptonisation and loss of gelatine; for it was absolutely certain that the zinc sulphate figure was inversely proportional to the time of boiling. Mr. Watson's objection that the peptone figure depended upon original materials probably only pointed to the fact that these materials had undergone peptonisation previous to manufacture owing, possibly, to faulty storing. He agreed with Mr. Watson that the total nitrogen figure contained a large number of nitrogenous bodies, and that alone it was useless, but still held firmly to his opinion that, when taken in conjunction with the zinc sulphate figure, it was of considerable value from a manufacturer's point of view. Mr. Watson appeared to have somewhat misunderstood the authors when he stated that they laid much stress upon the ratio between these two figures. The terms albumose and peptone nitrogen were of course merely used as a convenient way of expressing the facts of precipitation. Since the last meeting many samples of glue had been analysed in his laboratory which appeared to him to fully confirm the opinions expressed at the last meeting. In each case where he had two glues, one of which was of good quality and the second of low grade, he had found that by mixing them in certain proportions he was practically able to control both the zinc sulphate figure and consistency at will.

Mr. H. S. GARRY thought that they were indebted to both Mr. Watson and Messrs. Trotman and Hackford for the earnest endeavours they had made to throw some additional light on the complex nature of the problem in arriving at some standard of measurement of the value in glue samples. While there was much in both papers to which he took exception from a practical point of view, he emphasised the great necessity which existed for some method by which the value of a glue to the consumer could be readily ascertained. One great fault with most of the physical tests referred to was that they were cold

tests and the consumers generally used their glue hot. The consistency test was probably the best of its kind, but to get the best comparative results more than one standard glue was necessary. The range given in Mr. Trotman's table should run from 400 downwards instead of 150 to give the necessary adjustment of values, and the standard for 250 to 400 should be of a higher gelatinising power than the standard from 100 to 250 and so on. Another great difficulty with physical tests was that the solutions used did not approximate to those actually in use by the consumer. The comparison in 5 per cent. solutions was not readily applicable to the 30 to 50 per cent. solutions in everyday use as glue. He did not attach the same value to the viscosity test as Mr. Watson. He had an opportunity some little time ago of discussing this test with Dr. Fels in Berlin, and the impression received was that it was as yet in a somewhat immature condition, and, as a comparison of value, left much to be desired. He thought that the consistency test, while giving good comparative results of the cohesion of glue, did not express the value of the adhesive qualities, and that further research would be found to negative the reliance which Mr. Trotman placed on the consistency test and, along with it, the zinc sulphate test of nitrogen as indicative of adhesive properties. It might be taken that the gelatinising power of a glue over a certain limit was obtained at the expense of its adhesive properties and *vice versa*, and the two characteristics were neither proportional nor relative. The table given by Mr. Watson appeared to him to bear out the criticism he made at the time on Mr. Trotman's paper that the content of nitrogen and also the relative value did not depend so much on the method of manufacture as on the source from which the glue was derived. Mr. Trotman assumed that the proportion which the total nitrogen content bore to the percentage shown by the zinc sulphate test was an indicator of value. This would only be correct if the value of the albumoses were the same in each case. Taking the figures given in Mr. Watson's table, he found that the value of the zinc sulphate figures varied from 27.5 per unit to 5.5 per unit, and that in the case of three of the samples, in which the percentage of albumoses was equal, the value of the albumose units was 23.9, 13.9, and 8.4 respectively per unit. This was, of course, the positive side of peptones as a reduction of value in the glue, the basis of the calculation would give, in the case of the lower grades, a minus result greater than the actual price of the product altogether. It appeared, therefore, that if Mr. Trotman's claim were carried to its logical conclusion some separation and classification of the albumoses would require to be made, and he saw no other alternative but the classification of these to source from which they were derived.

Dr. F. S. KIPPING remarked that the figures given by Mr. Watson seemed to him to corroborate the conclusions drawn by Mr. Trotman at the last meeting.

Mr. H. J. WATSON could hardly agree with Mr. Garry in his remarks regarding the temperature of the physical tests, for, while the consumer usually used his glue at temperatures higher than those obtained in the physical tests, the real test of adhesiveness or breaking strain was with a set or cold glue. Perhaps this would be a point in favour of the consistency test, which was a comparison of glues under set and not in the liquid state as in the viscosity test. Referring to Mr. Garry's remarks on the viscosity test, it would be quite as easy to take a standard glue as the basis of comparison, as was the case in the consistency test, as to use water as the basis. His own objection to the viscosity test was that, when dealing with a large number of samples, considerable time and attention was required, while with the consistency tests it was a comparatively simple matter to deal with 40 to 50 samples at once without much attention. In a glue factory this was a considerable advantage. Referring for a moment to the table by Messrs. Trotman and Hackford, and accepting the theory that the consistency of a glue increased 10 for a difference of 1.4 in the zinc sulphate precipitate, according to the total nitrogen gelatin, the highest possible consistency would be 171 and would be attained by No. 4 sample. Further, if one took a gelatin with an average moisture and low ash, say 15 per cent. moisture and 1 per cent. ash, and called the difference (84 per cent.) gelatin, then the highest consistency test

attainable would be 234. He was aware that the units of their test might be entirely different from those in his, owing to using a different standard glue, but it would be interesting to know what was the highest consistency test they had attained by experiment and whether it had exceeded the highest possible calculated consistency test, as calculated from the zinc sulphate precipitate in their experiments.

Mr. S. R. TROMAN, in reply to Mr. Watson's observation as to the standard used in the consistency test, agreed with his conclusions, and stated that he had never found a consistency number greater than 170. Of course this merely indicated that he used a different grade of gelatin as his standard from that which Mr. Watson used.

Scottish Section.

Meeting held in Glasgow, on Tuesday, October 25th, 1904.

MR. R. T. THOMSON IN THE CHAIR.

HIGH-TEMPERATURE MEASUREMENTS (WITH DEMONSTRATION OF PYROMETER).

BY THOMAS GRAY, PH.D., D.Sc.

Of the numerous instruments which have been devised for the measurement of high temperatures, only those which have proved of practical value and with which the writer is personally familiar will be described and discussed in this paper. As he has no practical experience of the working of the Uehling pyrometer, which is widely used in the United States, and which has also found a limited application in this country, no further reference will be made to this form of instrument.

Pyrometers based on the Expansion of Solids, Liquids, and Gases by Heat.—Numerous attempts have been made to utilise the expansion of solids, more particularly of various metals, as a means of measuring temperature, but none of these have been successful on account of the alteration of structure and consequent change of the coefficient of expansion caused by exposure to high temperatures.

The application of the expansion of liquids is limited to low-temperature work; but a comparatively recent extension of the range of the mercury thermometer is noteworthy. Certified thermometers, constructed of boro-silicate glass, graduated in single degrees up to 550° C. (1022° F.), can now be obtained from any dealer in chemical apparatus.

The expansion of gases, or, more correctly speaking, the increase of pressure at constant volume due to rise in temperature, is the principle utilised in the well-known "air" thermometer, the standard to which all the other methods are referred. The apparatus employed is fragile, and the skill and care necessary for its manipulation render it unsuitable for technical work. Attempts have been made to give the instrument a more practical form by attaching an ordinary pressure gauge to a porcelain or metal bulb by means of a capillary tube. The difficulty of obtaining a material which will withstand the pressure and at the same time be impermeable to the furnace gases at high temperatures has proved insurmountable. The Thalpottassimeter, a pyrometer of a similar type, consisting of a steel reservoir containing mercury, connected by a capillary tube to a pressure gauge, has been used to a limited extent; in this case the increase of the vapour pressure of mercury with rise in temperature is measured by the gauge, which is empirically graduated in degrees centigrade or Fahrenheit. Leakage of air at the joint, which always takes place sooner or later, renders the indications of the instrument untrustworthy.

Change of State.—The melting points of the metals, their alloys and salts have long supplied a familiar means of

measuring temperature, but the difficulty of procuring a sufficient number of substances of ascertained melting point has, until recently, prevented the general application of the method. This difficulty no longer exists: Seger "cones" having melting points ranging from 590° to 1850° C., with intervals of about 20° C., are now procurable from any dealer in chemical apparatus. They consist of triangular pyramids composed of kaolin, mixed with silica, boric acid, and various metallic oxides in the necessary proportions to form a graduated series. The melting points of the various compositions have been determined by Hecht with the help of a standard thermo-couple. In applying the method, a number of cones, having a range of melting points which includes the temperature to be measured, is placed on a fireclay plate and introduced into the furnace. If the cones have been properly chosen the first members of the series will be observed to melt, whilst the last will remain unaffected. The melting point of the cone which just softens sufficiently to cause the apex of the pyramid to bend down to the base-plate is taken to be the temperature of the furnace.

The Calorimetric Method.—A cylinder or ball of metal is heated in the furnace and dropped into a measured quantity of water; from the rise of temperature of the water the temperature of the furnace is calculated. The metal used may be platinum, nickel, copper, or wrought iron. Platinum is to be preferred, as it does not oxidise when heated, and has no chemical action on water. The total heat of platinum up to 1600° C., i.e., the amount of heat which 1 gm. of the metal gives out when cooled from the various temperatures down to 0° C., has been carefully determined. From a chemical point of view nickel is more suitable than iron, but the determinations of the total heat of nickel by different observers do not show a very satisfactory agreement. Iron is the least suitable metal chemically, as it oxidises, scales, and decomposes water at high temperatures; but it possesses the advantage of being always available, and the cylinder is thus easily replaced if lost. A large number of determinations have been carried out in the author's laboratory, using an iron cylinder; of these the results of two students chosen at random may be given to illustrate the degree of accuracy which may be expected:—

	A.			B.		
	1.	2.	3.	1.	2.	3.
	° C.	° C.	° C.	° C.	° C.	° C.
Temp. by thermo-couple.	812	748	724	734	661	756
Temp. by calorimeter	805	740	723	745	690	790

The calorimeter vessel which was used for these experiments is constructed of thin sheet copper, and has the form of a cylinder with a flanged top; a perforated tube soldered on to the inside serves to protect the thermometer from fracture when the iron cylinder is dropped into the water. The capacity of the vessel is approximately 150 c.c., and the weight of the iron cylinder about 18 grms. The calorimeter vessel hangs supported by the flange in a wider cylinder of metal or wood, leaving an air space of about 1 in. to minimise loss of heat by radiation. The vessel is covered by a lid having a small hole through which the thermometer passes, and a larger one for the introduction of the heated metal cylinder; the rod of a stirrer also passes through the latter opening. A thermometer graduated in 1/10° C. is used. A very useful table, which gives the total heat of wrought iron at various temperatures up to 1100° C., appears in Fischer's "Brennstoffe," pp. 62 and 63.

The figures given above show that the method is capable of giving results sufficiently accurate for most practical purposes. It should, however, be noted that it becomes less accurate at higher temperatures on account of the increased loss of heat in carrying the crucible containing the metal cylinder from the furnace to the calorimeter.

By using a fixed ratio between the weights of metal and water, as in the well-known Siemens' form of calorimeter, some labour in calculation is saved; but the advantage is

doubtful, except in the case of platinum, as the change of weight due to oxidation and scaling necessitates frequent renewal of the metal cylinders. In the Siemens form, 1 pint (568 c.c.) of water is used, and the weights of the metal cylinders are so adjusted that their heat capacity at ordinary temperatures is exactly one-fiftieth of that of the calorimeter vessel filled with 1 pint of water. The weights used are, copper, 137; wrought iron, 112; nickel, 117; and platinum, 402.6 grms. The high temperatures are graduated on a brass scale, which slides on the thermometer, allowance being made for the increase of the specific heats of the metals with rise of temperature. In using the pyrometer, exactly 1 pint of water is poured into the vessel, and, when the temperature has become constant, the sliding scale is set so that the pointer attached to it is on a level with the top of the mercury thread of the thermometer. The heated metal cylinder is then dropped into the water, and when the maximum is reached the readings of the thermometer and on the sliding scale at the level of the top of the mercury thread are noted; the sum of these gives the temperature to which the cylinder was heated. This form of the apparatus has the advantage of being practically direct reading, but the high price of platinum almost precludes the use of such a large quantity of the metal. If copper or iron be used, frequent checking of the weights and correction for loss due to scaling are necessary. The labour of calculation, using a home-made calorimeter such as the one first described, is lessened considerably by the use of tables of total heats; these may be found in "High Temperature Measurement," by Le Chatelier and Boudouard; translated by Burgers.

The Thermo-Electric Method.—In this method the electro-motive force which is generated when the junction of two dissimilar metals is heated, is measured, and from the value of this the temperature of the heated junction is deduced. The metals which are suitable for this purpose must have a high melting point, and should not alter in structure and composition when heated; they must also be perfectly homogeneous. When a wire which is not homogeneous throughout its length is heated locally by a flame an electro-motive force is generated the value and sign of which vary according to the position at which it is heated, and if the two ends of the wire are joined, an electric current, varying in intensity and direction with the position of the flame, will flow through the wire. If the wire is homogeneous it may be heated at any part without formation of an electric current. The absence of such parasitic currents is obviously a necessity, as these will increase or diminish the intensity of the current due to the heated junction to an extent which will vary with the length of the wire heated in the furnace. The metals which most nearly fulfil the conditions referred to above are platinum and the metals of the platinum group; and the thermo-couples used practically are composed of wires of platinum opposed to an alloy of platinum either with 10 per cent. of rhodium or with 10 per cent. of iridium. The E.M.F. of the platinum-platinum-iridium couple is greater than that of the platinum-rhodium, but the latter gives more constant results, as it is less easily hardened mechanically, and is therefore to be preferred. It may be here noted that an electro-motive force results on heating the junction of a metal in the soft state with the same metal in the hardened state; any local hardening which may be caused mechanically will give rise to parasitic currents.

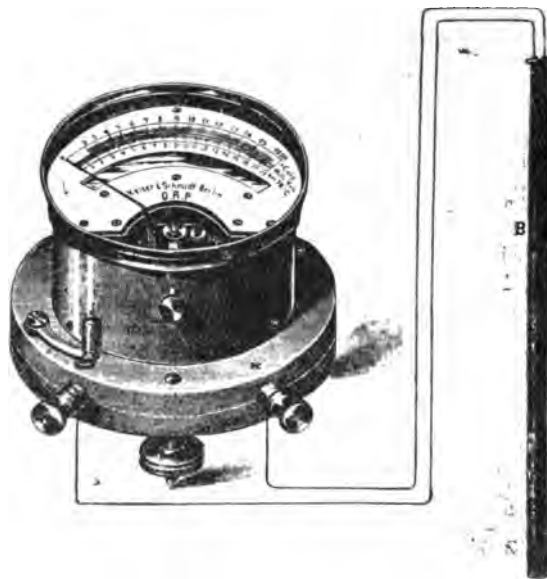
FIG. I.



The wires of the couple are joined by fusion in the oxyhydrogen flame, insulated by threading through perforations in a porcelain rod about $\frac{1}{4}$ in. in diameter, and the free ends of the wires are connected to terminals in a wooden handle. As the composition of the wires is rapidly altered by exposure to heated furnace gases, the couple is enclosed in a porcelain tube glazed within and without, which is sometimes encased in a wider iron tube to minimise the risk of fracture. Fig. I. shows the method of insulating the wires, with the porcelain protecting tube in section

The couple is used in conjunction either with a potentiometer or with a direct-reading galvanometer, the scale of which is graduated in millivolts and also in degrees centigrade or Fahrenheit up to 1600°C . The latter arrangement is the one more frequently employed, as it is more convenient and less costly. The instrument is of the D'Arsonval type; it consists of a coil of insulated wire of comparatively high resistance (100 to 200 ohms) suspended by a phosphor-bronze strip or spiral suspension between the poles of a powerful permanent magnet; a needle attached to the coil plays over the scale, and indicates the intensity of the current passing through the instrument. The galvanometer may be placed at any distance from the furnace containing the couple, provided that the resistance of the connecting leads does not exceed 1 ohm. Fig. II. shows the instrument connected to the couple.

FIG. II.



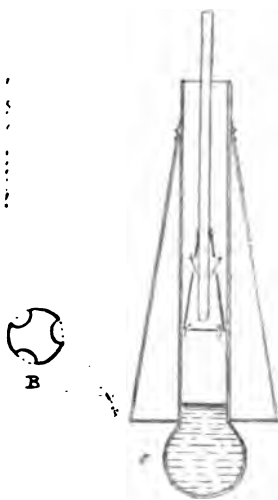
To convert this into a recording instrument the ordinary method of attaching a pen to the needle cannot be employed. Coils of high resistance must be used in the galvanometer, so that the resistance of the leads may be negligible, and the currents thus available are much too small to enable the needle to overcome the friction of the pen on the paper. It may be made to record photographically by attaching a mirror to the coil; light, passing through a slit, is reflected from the mirror and falls on a moving photographic plate or sheet of sensitised paper, thus recording the movements of the coil. The Roberts-Austen photographic recorder, an instrument of this type, has been successfully used for a number of years (see this J., 1892, 840). The record is made on a sheet of sensitised paper fixed on a drum, which revolves once in 6, 12, or 24 hours. An ingenious method of recording is employed by Messrs. Baird and Tatlock, Glasgow. The galvanometer is similar to that shown in Fig. II., but the scale of the instrument consists of a movable stirrup, which is depressed by clockwork every minute. The indicating needle, which is provided with a sharp point, plays under the scale, and when the latter descends this point is brought into contact with an inked strip of cloth, and thus marks the position of the needle on the paper below it. The paper, which has a graduation similar to that of the galvanometer scale, has also the time in hours and minutes marked along its edge, and is made to travel slowly forward by the clockwork mechanism. An examination of this paper shows the position of the galvanometer needle at intervals of one minute during the whole 24 hours, and, unless the temperature is varying very rapidly, a continuous record may be obtained by joining the various points. Another form of instrument, which traces a continuous record on a revolving drum, is made by the same firm.

Each division on the scale of the galvanometer represents about 20°C ., and the temperature may be estimated to the nearest 5°C . This does sufficient justice to the method at the higher temperatures, as an accuracy greater than 5° in 1000°C . is not guaranteed. As the couple is standardised with the cold junction at 0° , the temperature of the latter should be observed; if under 30°C ., a sufficient correction for practical purposes is made in the case of the platinum-rhodium couple by adding $0.5 \times t^{\circ}$ to the reading, where t° is the temperature, on the centigrade scale, of the junction of the leads with the wires of the couple.

If the porcelain protecting tube fractures, and the couple is exposed to the action of reducing gases at a high temperature, the wires soon become brittle, and the indications of the instrument then become untrustworthy. Vapours of the metals and substances which act chemically on platinum have a similar effect. Concerning the extent of the variation of the electro-motive force of thermo-couples, caused by exposure to the action of various chemicals, little information is available, but if the platinum has been obviously altered in composition through fracture of the porcelain tube the couple must either be replaced or re-standardised. The boiling and melting points of a number of substances have been accurately determined, and these may be utilised for standardising the couple. The boiling point of sulphur, 852°C ., and the freezing points of sodium carbonate, 852°C ., and of potassium sulphate, 1066°C ., are convenient temperatures. The freezing points of a number of the metals have been ascertained with a high degree of accuracy (Heycock and Neville, *J. Chem. Soc.*, 1895, 185). These are much more sharply defined than the freezing points of the two salts mentioned above; but whilst the bare wires of the couple may be placed directly in the fused salts, they must be protected by a porcelain tube from contact with the molten metals. On this account the salts will probably be found more convenient for technical work.

For the determination of the E.M.F. at the boiling point of sulphur, the apparatus used by Heycock and Neville (*loc. cit.* 197) in the standardisation of the platinum resistance thermometer is convenient. This consists of a hard glass tube about 18 ins. long by 2 ins. wide, with a bulb at the bottom, of diameter about 3 ins. To minimise loss of heat by radiation, the tube is surrounded by an asbestos cone with its base, diameter 6 ins., resting on the bulb. The

FIG. III.



condensed in the higher parts of the apparatus flows back over the sides of the cone. The base of the cone is shown at B. The sulphur is kept boiling by means of a large Bunsen flame protected from draughts. The insulated couple is suspended in the inner tube, and when the temperature has become stationary the position of the needle is noted.

space between the cone and tube is packed with asbestos wool. The level of the molten sulphur should be from 1 in. to 2 ins. above the base of the cone, to prevent superheating of the vapour. A thin-walled glass tube about $\frac{1}{2}$ in. in diameter, and closed below, is supported in the wider tube, as shown in the accompanying sketch (Fig. III.). On the bottom of this tube a thin asbestos cone is fixed with iron wire, to prevent the liquid sulphur from condensing and collecting on the bottom of the tube. The cone is perforated at the base and sides, so that the sulphur vapour passes through and heats the tube, whilst the liquid

For the freezing-point experiment the sodium carbonate or potassium sulphate is fused in a large covered platinum crucible; in the former case a gas blowpipe supplies sufficient heat, but a small blast furnace is required for potassium sulphate. When the salt is completely fused the gas is turned off, the junction of the couple is immersed in the molten salt, and the galvanometer needle is observed. The temperature falls very quickly at first, but when solidification begins the needle halts momentarily on account of the liberation of the latent heat; when solidification is complete the cooling again takes place rapidly. The position at which the needle remains stationary is noted as the value of the E.M.F. at the temperature in question.

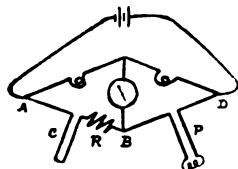
The graph representing the relation of E.M.F. to temperature is very nearly a straight line, but it is advisable to determine more than two points experimentally; unless the range over which the couple has to be used is small. If the interval between the two points does not exceed 300° to 400°C . a line between these will represent the relation with sufficient accuracy for most technical purposes. It is scarcely necessary to add that the temperature to be measured must be within the range of the points determined, or if outside these limits it must lie close to them.

The method described above is convenient, as the necessary materials are always available, and if used with a standard couple it also serves to check the indications of the galvanometer; but it will be found more suitable in practice to have the means of fixing a larger number of points by testing the couple against a standard which is reserved for this purpose. In using this method the two couples—the standard, and the couple to be tested—are stretched out so that each forms a continuous wire, and threaded through the insulators so that the two junctions are as near together as possible. They are then placed in a porcelain tube and inserted into a furnace; the free ends (the so-called cold junctions) are gathered together and wrapped in cotton-wool, taking care that they remain insulated from one another; or, if greater accuracy is required, the cold junctions are immersed in melting ice. The free ends are connected, through a two-way switch, to the galvanometer in such a way that the standard couple is in circuit in one position of the switch and the couple to be standardised in the other. By switching in the standard couple, the temperature of the furnace is obtained with the help of the table of E.M.F.'s supplied, and the value for the other couple at this temperature is then ascertained by bringing the switch into the second position and noting the reading on the galvanometer. Any number of points within the range of the furnace can thus be readily determined, and these are subsequently plotted out on squared paper in the usual way; a convenient scale is 1 mm. = 5°C . = 0.05 millivolt. Care should be taken to close the ends of the furnace well, to prevent draughts of air, which might cool one of the couples to a greater extent than the other. For temperatures up to 1400°C . a convenient form of electric furnace, wound with platinum foil, is supplied by Heraeus, of Hanau. A resistance furnace for temperatures up to 1200°C . is cheaply constructed by winding nickel wire, 16 to 18 B.W.G., closely round a porcelain tube about 1 ft. long by 2 ins. to 3 ins. in diameter; the nickel wire is covered over with a paste of magnesia and water to prevent oxidation. When dry it is surrounded by a piece, about 3 ins. thick, of the magnesia covering which is used for insulating steam pipes. The furnace is connected with the electric mains through a suitable resistance, which admits of varying the temperature to the desired extent.

The Platinum Resistance Thermometer.—The utilisation of the increase of the resistance of a platinum spiral due to heating was first proposed and applied practically by Siemens as a means of measuring temperature. The construction of the thermometer was subsequently improved by Callander, who replaced the porcelain cylinder on which the spiral was wound by two slips of mica set at right angles to one another, so that the wires of the spiral touched the edges of the mica only, and thus reduced to a minimum any change of resistance due to the action of silica on platinum at a high temperature. The law connecting the resistance of platinum with temperature was determined by Callander

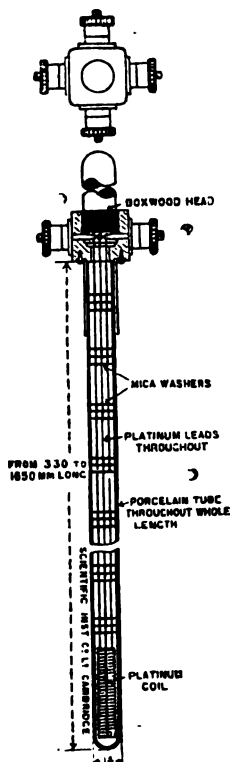
and Griffiths up to 600°C ., with the help of an air thermometer. The accompanying illustration (Fig. IV.) shows the construction of the platinum resistance thermometer made by the Cambridge Scientific Instrument Co. It consists of a spiral of thin platinum wire wound double round a framework composed of two strips of mica, which in section have the appearance of a cross. The free ends of the spiral are joined to stout platinum leads, which, near the top, are fixed to copper wires connected to binding screws in the wooden handle. As the resistance of the platinum wires increases with rise in temperature to an extent which varies with the length heated, a compensating arrangement is introduced. This consists of a continuous platinum wire of the same dimensions as those of the leads, which is doubled on itself and fixed so that the bend reaches the beginning of the spiral. The four wires are arranged symmetrically, and are insulated and held in position by a number of perforated mica discs, through which they pass.

FIG. IV.



The ends of the compensator are connected with the two additional terminals shown in the illustration. The spiral and wires are enclosed in a porcelain tube, diam. $\frac{1}{2}$ in., glazed outside and in. The method of measuring the increase of resistance is that of the familiar Wheatstone bridge shown in the accompanying diagram (Fig. V.). For the sake of clearness, the compensator, which lies alongside the platinum leads within the porcelain tube, is represented apart from them in the diagram. The resistance of the arm AB, which includes the compensator C and the rheostat R, is equal to that of the arm BD when the thermometer P is at 0°C ., and in this condition no current passes through the galvanometer when the battery circuit is closed. This equality is disturbed when the thermometer is heated, and the increase of resistance of the spiral is measured by determining the resistance which must be added by the rheostat to re-establish equilibrium. This additional resistance represents that due to the heating of the spiral alone, as the increase of resistance of the leads is exactly compensated for by an equal increase in that of the compensating wire C. Fig. VI. illustrates the Whipple indicator, a convenient portable form of this apparatus suitable for technical work. The rheostat con-

FIG. V.



sists of a continuous wire, wound on the inside of a drum, provided with a contact, which slips over the wire as the drum is rotated by the handle H; the position of this contact is indicated by a pointer A outside the drum. On the outer surface of the drum, visible at A, the temperatures corresponding to the added resistances are marked in degrees centigrade or Fahrenheit up to 1400°C . In

FIG. VI.



making an observation, the four binding screws T of the indicator are connected with the terminals of the thermometer by means of four insulated copper wires, as shown in the illustration, and the handle of the rheostat is turned till no movement of the galvanometer needle B is observed when the battery circuit is closed by depressing the key F. The temperature is then indicated on the drum by the pointer A. The indicator may be placed at any convenient distance from the thermometers, and by means of a suitable switchboard can be connected to any one of them. The resistance of the flexible leads has no effect on the accuracy, as that of the pair from the platinum spiral is exactly counterbalanced by the resistance of the pair connecting the compensator to the indicator. The apparatus is very sensitive, and readily indicates differences of temperature of less than 1°C . A recorder for use with the platinum resistance thermometer is made by the same firm.

Optical Pyrometers.—These instruments utilise the increase of intensity of the luminous radiations of a heated body with rise of temperature as a means of measurement. The intensity of the radiations emitted by different bodies at the same temperature varies with the nature of the heated substance; so-called "dark" bodies, of which lampblack is the best example, have a high emissive power, whilst that of highly polished metallic surfaces is small. A pyrometer based on the ascertained law which governs the relationship between the intensity of the luminous radiation and the temperature will only give correct indications in the case of substances which have the properties of a dark body, viz., the power of absorbing completely the light which falls on them, and consequently of radiating light of every colour and wave-length. Iron in the incandescent state reflects very little light, and consequently approximates to the condition necessary. Polished platinum, on the other hand, reflects a large proportion of the light which falls on it, and consequently does not satisfy the necessary condition. Lampblack approximates most closely to the theoretically dark body. According to Kirchhof, however, the intensity of radiation of a closed space provided with an opening through which it may be viewed, is the same as that of a dark body, so that all closed furnaces comply with the necessary conditions.

The gradual change of colour from dull red to dazzling white which is observed when a body is heated, serves as a rough gauge of the temperature. If the substance which is being gradually heated is viewed through a spectroscope,

a dark red band is first seen; this gradually broadens, and at higher temperatures the colours yellow, green, blue, and violet successively appear, forming a continuous spectrum. Simultaneously with this extension of the spectrum there is observed an increase in the intensity of each of the individual colours, and this increase may be utilised as a measure of the temperature.

The Wanner Pyrometer.—In this instrument the light emitted by the heated body, the temperature of which is being measured, is broken up by a train of prisms, and the spectrum is screened off so that only the red portion corresponding to the Fraunhofer C line is visible. The intensity of this is compared with that of the red radiation from a small 6-volt electric lamp. The pyrometer has the external appearance of a telescope about a foot long; at the end which is directed towards the furnace there are two slits, one half of which is covered by the small electric lamp. When the instrument is directed towards the furnace, the field, as viewed through the eye-piece, is seen to be composed of two semicircles; one of these is illuminated by the lamp, and the other by the light from the furnace. The two halves of the field can be adjusted to equal intensity by rotating the analyser, which forms the eye-piece of the instrument; and, from the angle through which the eye-piece has been turned to produce equality of colour, the temperature is ascertained by reference to a table.

FIG. VII.

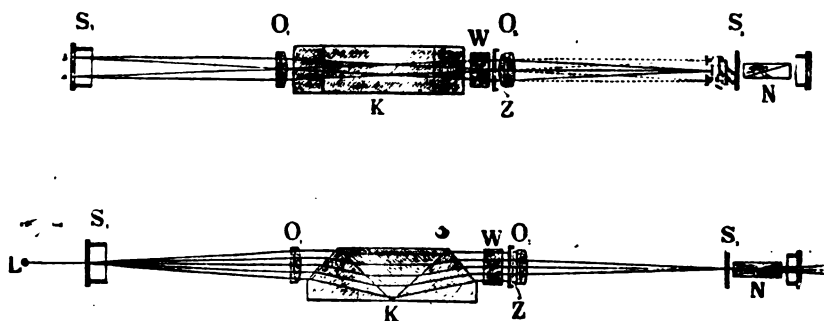
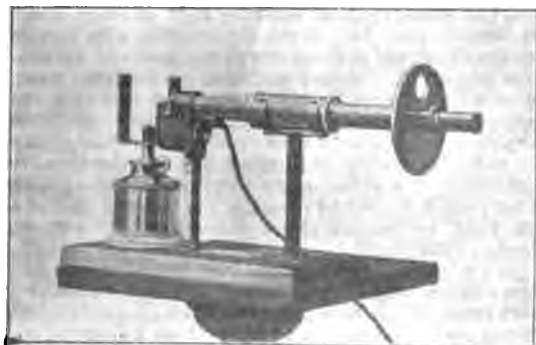


Fig. VII. shows sections through the instrument in two planes at right angles to each other. The light from the two sources *a* and *b* (lamp and furnace) passes through the slit *S*, which lies in the focus of the lens *O*; it is broken up into its constituent colours by the train of prisms *K*, and is subsequently polarised by the Nicol's prism *W*; the rays then pass through a double prism *Z*, and are afterwards brought to a focus by the lens *O*₂. Two images of *a*, due to the ordinary and extraordinary rays, and two of *b* are thus formed, but the prism *Z* is so constructed that the image of *a*, due to the ordinary rays, coincides, in front of the eye-piece slit *S*₂, with that of *b*, due to the extraordinary rays. On looking through the eye-piece the upper half of the field is seen illuminated by rays from *a*, and the lower half by those from *b*, as the sets of

FIG. VIII.



rays are polarised in planes at right angles to each other. Rotation of the analyser *N* has the effect of intensifying one half of the field and weakening the other.

The electric lamp must be adjusted periodically by comparison with the flame of a lamp burning amyl acetate. For this purpose it is placed on the stand with the slit directed to the flame of the amyl acetate, as shown in the illustration (Fig. VIII). The analyser is set at zero, and the resistance in circuit with the lamp is adjusted so that the upper half of the field, illuminated by the electric lamp, has the same intensity as that of the lower half, lit by the amyl acetate flame. The instrument is then ready for use. The standard is the flame of amyl acetate, but as it would be impossible to apply it practically, on account of the flickering caused by draughts of air, an electric lamp is adjusted to this standard and used in its place.

Two forms of this instrument are made—one for measuring temperatures from 900° to 2000° C., and the other for the range 900° to 4000° C. The adjustment to equality of illumination can be easily and quickly made; the error is approximately half a degree of rotation, which corresponds in the first of these instruments to about 5° at 1300° C., and 14° at 1600° C.

Discussion of the Various Types.—For occasional observations of temperatures up to 1000° C. the calorimetric method, using an iron cylinder, will be found serviceable. The comparatively trifling cost of the apparatus is its chief

recommendation. For higher temperatures a platinum cylinder may be used, but care must be taken to avoid loss of heat in transferring the cylinder from the furnace to the calorimeter. On account of this possible source of error, the writer would prefer to rely on the use of Seger cones for occasional determinations within the range 1000° to 1800° C. As a continuous means of indicating and recording temperatures up to 1600°, the thermo-electric method is the most generally useful. The

fragile character of the porcelain protecting tube is a very decided drawback, as the cost of frequent renewals is high. If care be taken to avoid rapid change of temperature by warming the tube slowly before introducing it into the furnace, and by allowing it to cool gradually during the withdrawal, such a tube may last for months. If it were possible to produce quartz tubes of the necessary size at a reasonable cost, the adoption of this material would add greatly to the utility of the method. When fracture of the porcelain tube does take place, the wires of the couples are easily joined if broken, and restandardisation is a very simple operation when the necessary arrangements are available. In cases where a very long couple is used the increase of resistance due to heating may introduce an appreciable error; on this account, galvanometers with high-resistance coils should be employed.

Where a close indication of temperatures up to 1000° or possibly to 1200° C. is required, and for all low-temperature observations, such as in cold storage, the platinum resistance thermometer may be recommended. It is much more sensitive than a thermo-couple, and, when combined with the Whipple indicator, readily shows differences of less than 1° C. In situations where the porcelain protecting tube is liable to fracture, the thermo-couple will be found more satisfactory. The platinum spiral is readily affected by hot furnace gases, and if damaged is much more difficult to repair and less easily standardised; the cost of renewal is also considerably greater. For temperatures above 1600° C. some form of radiation pyrometer is necessary, and here the Wanner pyrometer will be found serviceable. Its accuracy is now certified, if desired, by the Physikalische technische Reichsanstalt, Charlottenburg. Although it does not indicate directly, the observation is easily and quickly made, and where a number of measurements of the temperatures of various furnaces have to be made, it is

possible to operate more quickly than with a thermo-couple, on account of the necessity to allow the latter to heat and cool slowly, in order to prevent fracture of the porcelain tube. If the unprotected couple is used, or if a couple is kept permanently fixed in each furnace with a suitable switch to bring it into connection with the galvanometer, this advantage disappears; but the cost of upkeep of the couples and tubes, and the labour of standardising or renewing the couples, are greatly increased. The fact that the instrument itself is not heated is a strong recommendation, as the destructive action due to exposure to high temperatures is in some cases excessive with the other forms of pyrometer. The limitations to the use of the instrument referred to in the description should be noted.

*Meeting held in Edinburgh, on Friday,
December 6th, 1904.*

DR. HUGH MARSHALL IN THE CHAIR.

THE EXAMINATION OF LINOLEUM AND THE COMPOSITION OF CORK.

BY DR. HARRY INGLE.

In the past the testing of the fabrics known as linoleum, inlaid linoleum, cork carpet, &c., for their suitability as a floor covering has been mostly based upon appearances and rule of thumb. The only exception to this rule, so far as the writer is aware, are the tests applied by the British, German, and French Governments, for the most part not published. H. Burchartz, of the Königlich Preussische Techn. Versuchsanstalt at Charlottenburg (this J., 1900, 255), gives the tests applied by the German Government. These tests will be noticed later, as well as others applied by various users.

Before proceeding to a detailed discussion of the tests it would be best to clearly define the varieties of linoleum, &c., met with in the trade. A detailed description of the linoleum manufacture, with the history of the industry, was read by W. F. Reid before the London section of our Society (this J., 1896, 75). Since then, however, the trade has developed, and many new varieties of linoleum are to be met with. These fabrics may be grouped into the following classes:—Linoleum, Plain and Printed; Inlaid Linoleum; Cork Carpet. Plain and printed linoleums, apart from the jute canvas, and backing, consist essentially of cork, pigment and a cement. The cement is obtained from linseed oil either by oxidation or polymerisation. In the oxidation processes, introduced by Walton, the inventor of linoleum, the linseed oil is converted into a semi-solid substance by exposure to air, either by running it when charged with a drier over thin cotton (the scrim process) or by exposing it to air in the form of finely divided drops (as in Walton's later patents). This semisolid is then melted with a certain proportion of kauri gum and resin to produce the cement.

In the polymerisation process (Taylor-Parnacott patents) the oil is converted by the action of heat into an elastic rubber-like substance. This may be used as the cement or in combination with resin. The plain linoleum thus obtained from the cement, cork, and pigment, may be printed with oil colours to produce designs (printed linoleums).

Inlaid Linoleums.—In these the design permeates the body of the material. They are made by a variety of processes; for detailed information on which the patent literature in the Society's journal may be consulted. Granite linoleums also belong to this class. The composition varies from that used in plain or printed linoleum, inasmuch as it contains in place of some of the cork a varying proportion of wood-dust, and usually a larger percentage of pigment. The cement used in inlaid linoleum, so far as the writer is aware, is always made by the Walton oxidation process.

Cork Carpet.—In these the cork grains used are larger. Wood-dust is never employed, and the quantity of pigment is usually, though not always, smaller than in plain and inlaid linoleums. Both kinds of cement are used. ✓

Having thus described the various kinds of linoleum and linoleum-like products, I will now devote some space to a discussion of the methods of examination already proposed and to the description of my own experiments.

Determination of Ash.—The ash obtained on incineration of linoleum gives a roughly approximate indication of the quantity of pigment present. This is only the case, of course, when inorganic pigments, such as oxides of iron, have been used to colour the linoleum. Organic, or partly organic pigments, such as the colour-lakes and Prussian blue, leave only their mineral ingredients behind as ash. Another source of error arises from the fact that corks used lose their water of hydration. Compensating these errors are the facts that the cement leaves behind the driers used, and that cork itself is not absolutely free from mineral matter. Cork gives an ash content of from 1·8 to 3 per cent.

The quantity of ash given by different makes of linoleum varies very much. Inlaid linoleums usually give the most ash, although I have found some samples of German-made plain linoleum almost as high in ash content. One sample of plain green linoleum made by a German firm gave 27·4 per cent. of ash. Light-coloured linoleums usually contain more ash than those of dark colour, as more pigment has to be used to cover the colour of the cork.

Now, as to the value of a determination of the ash content in gauging the quality of a sample of linoleum, the following considerations may help us:—

(1) A large ash content indicates an increase in weight per square yard, a harder and less resilient, and consequently a more noisy, linoleum to the tread. It also shows that the linoleum is a better conductor of heat and less warm to the feet.

(2) As pigments do not possess the elasticity of cork, a linoleum containing a large amount of ash, anything above 20 per cent., is apt to be brittle. This was shown by the above-cited German sample. In the manufacture of inlaid linoleums which contain light colours this is corrected by an additional amount of cement.

(3) With regard to the wearing properties of a linoleum containing a large amount of ash, I have no reliable data, but I am inclined to think that the ash content would not have any important influence.

Attrition Test.—At the Königlich Preuss. Techn. Versuchsanstalt at Charlottenburg the linoleum is subjected to a certain number of revolutions of a loaded leaden disc of known area and fed with a given quantity of emery powder, and the weight lost per 50 sq. cm. is determined (Burchartz, *loc. cit.*).

This method is doubtless a valuable one, but the results obtained are largely dependent on the nature of the machine used, and the method, moreover, is somewhat difficult to carry out, requiring apparatus such as is not usually available in the chemical laboratory.

Bending Tests.—Burchartz (*loc. cit.*) recommends the testing of linoleum by bending it over mandrels of 23, 25, 30, &c., mm. diameter. Such tests require to be carried out with discretion. Their value obviously depends upon the use to which the linoleum is to be put. Stair cloth should of course withstand the most severe test in this respect, but for linoleum which is to be laid flat the test is of less importance, except in so far as it shows how far the linoleum is likely to suffer in the handling before it is laid and is a partial measure of certain other properties of the linoleum.

Speaking generally, the thinner qualities of these fabric will stand bending over a smaller mandrel than the thicker, but they do not on that account wear longer. Printed linoleums usually crack more easily than plain goods, and inlaid linoleum does not stand bending so well as printed linoleum, but it wears longer. Obviously the test requires caution in its application. Applied to samples of the same class of fabric it is valuable as an indication of adhesion between the grains of cork pigment and cement, but it is of little use in differentiating between the wearing qualities of two dissimilar fabrics.

Tensile Strength.—This may or may not be a factor of importance in the valuation of linoleum for use under

ordinary circumstances. As usually linoleum is not subjected to any stretching strains, I must confess I fail to see its value. However, H. Burchartz (*loc. cit.*) tests the strength of linoleum in the direction of calendering and at right angles to it, and for his results the reader is referred to the original paper.

Determination of Cork and Cement Content.—At first sight this seemed an easy problem; all that appeared necessary was to treat the linoleum with an alkali, when the oxidised oil and resin in the cement would be converted into soaps which could be removed from the cork by filtration, the acids precipitated in the filtrate and weighed. Knowing that cement contained about 80–90 per cent. of fatty and resin acids, the result of the experiment should show the cement content.

On carrying out the experiment with a linoleum of known composition it gave a result 19 per cent. too high. It was thus seen that this method was unreliable. I consequently determined to examine the matter *da capo*, namely, cork itself and the chemistry of this substance.

Composition of Cork.—Very little appears to be known as to the composition of cork. Chevreul found in it a white waxy substance soluble in alcohol and ether which he called cerin or cork wax. From this Siewert isolated a substance called by him phellyl alcohol, deca-acrylic acid and another acid. The amount of ether extract is given at 1.8–2.5 per cent. of the cork. There remains a substance insoluble in ether termed by Chevreul suberine or cork proper. By the action of nitric acid (20–30 per cent.) a residue of from 3–5 per cent. of cellulose was obtained, the main mass of the cork being oxidised to a mixture of fatty acids of which suberic acid is the chief. By heating cork with sodium sulphite solution to 166° C. a residue of from 9–12 per cent. of pure cellulose was obtained. For other information on cork see Watts' Dictionary, Vol. I., page 72. I was unable to find any their information in the literature on the subject of cork.

The following experiments were carried out. Ordinary ground cork such as is used in the manufacture of linoleum was dried and extracted in a Soxhlet extractor with ether and then with alcohol:—

100 grms. of cork	
4.5 per cent. ether soluble	95.5 per cent. other insoluble
3.2 per cent. alcohol soluble	92.3 per cent. residue.

The ether soluble portion was crystalline and yellowish-white in colour. The alcohol soluble portion was a reddish-brown, amorphous solid.

The action of alcoholic potash on cork is of interest in this connection. 10 grams. of dried cork were treated with alcoholic potash on the water-bath for six hours in a flask provided with a reflux condenser. The contents of the flask were filtered, the residue washed with alcohol, dried,

and weighed, and the alcoholic filtrate and washing kept for examination. The residue was then ignited, and the ash, consisting mainly of potassium carbonate weighed. Another 10 grms. were saponified in the same way, the precipitate washed with alcohol and then with hot water, and the two washings kept separate. The residue, consisting of cellulose and ash, was dried and weighed and the ash determined by ignition.

In the table at foot of page the two experiments are combined. Collating these results it appears that the saponification of cork produces the following:—

(a) Cellulose	24.4
Ash	1.8
(b) and (f) Ether-soluble acids	22.63
(e) Ether-soluble unsaponifiable	3.45
(d) Alcohol-soluble, but ether insoluble, unsaponifiable	7.4
(c) Ether- and water-insoluble, but alcohol-soluble acids	5.9
Alcohol- and ether-insoluble, but water-soluble acids and loss	34.37
	100.00

(a) consists of cellulose and lignin.

(b) is a dark brown sticky resinous substance of an acid character, soluble in ether and alcohol.

(c) is a dark-red brown amorphous brittle resinous substance of acidic character.

(d) is a white semi-crystalline substance of a neutral character. It is very insoluble in cold, but slightly soluble in hot alcohol, the solution of which gelatinises on cooling; m. pt. 210°–230°.

(e) consists of more or less white needles which are not acid in character.

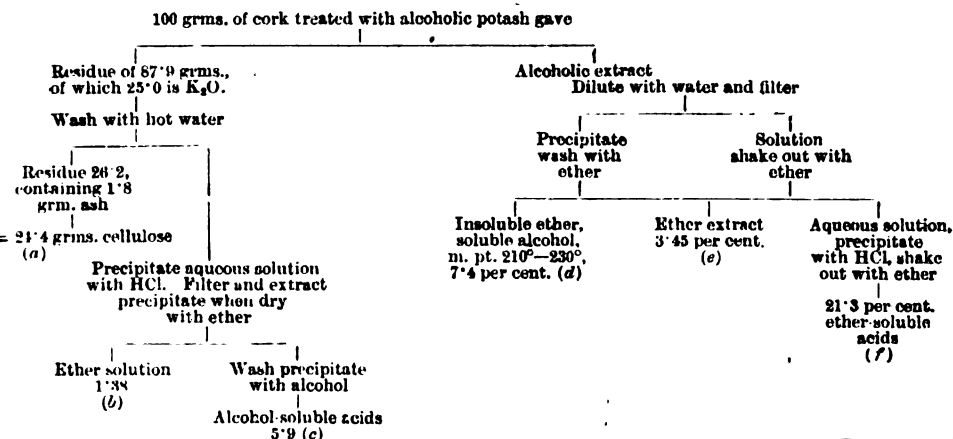
(f) consists of a sticky waxy substance of light brown colour and acidic character. It has an iodine value of 45 (Wijs), and would thus appear to be unsaturated. It is soluble in ether and alcohol, partly in petroleum ether.

An examination of these substances is in hand. From the above it is clear that any attempts to determine either the amount of cork or of cement in linoleum by saponification is futile, because the acids precipitated from the soaps and dissolved in ether must contain not only the oil and resin acids, but also all the ether-soluble substances derived from the saponification of the cork present, every 100 parts of which yield 25 parts of ether-soluble substance, leaving only 24.4 parts of cellulose behind.

However, cork varies very much in composition, the cellulose varies from 20 to 35 per cent., and consequently the ether-soluble portion must also vary very much.

From what has been said it is clear that it is impossible to determine the quantity of cement and cork present in a linoleum by the saponification method.

Ether Extract.—Pinette (this J., 1892, 550) considers that the linoleum giving the most ether extract is the most valuable because, he says, it contains the most oil.



Lewkowitsch (Oil, Fats, and Waxes, 2nd edition, p. 741) disputes Pinette's conclusion, because he considers that a large amount of extract shows that the linoleum cement has not been sufficiently oxidised in stoving, since linoxyn, the final product of oxidation of the cement, is insoluble in ether.

There is an element of truth in both these contentions; but again, before deciding upon the value of this constant as a criterion of the quality of the linoleum, several factors have to be taken into account.

Of what does the extract consist? The non-oxidised or non-oxidisable portion of the linseed oil and of the gum and resins used in the manufacture of the cement. It is also swelled by the ether-soluble constituents of the cork, which we have seen may reach as high as 4.5 per cent.

Now, if the linoleum be made solely from polymerised linseed oil (Taylor's cement), then we have only the non-oxidisable portions of the linseed oil and the cork extract. Samples made in this way I have found to give an extract of from 8 to 10 per cent. Sometimes the cement thus prepared is afterwards mixed with resin (the presence of which in the extract is readily recognised by the Liebermann-Storch reaction) and then the ether extract may rise to as high as 17.8 per cent.

If the linoleum be made from cement made by the oxidation process, then it contains in addition the non-oxidisable portions of the gum and resin. Consequently, linoleums thus made must always give a larger ether extract than those made with Taylor cement only. In examining such linoleums I have found extracts varying from 16.9 up to 28.3 per cent. (see table below). It is thus clear that with the same class of cement the linoleum which yields the most extract contains the most cement, but that it is not right to compare two linoleums made from different kinds of cement.

Moisture Content.—A determination of the moisture present is of importance, as it reveals the amount of surface presented by a given weight of linoleum, and hence is proportional more or less to its porosity. It is determined by drying for one hour in the water-oven. The amount is only small, varying from 1.3 to 4.3 per cent. (for details, see table below).

The importance of non-porosity of linoleum will be treated below.

Action of Water.—Burchartz cemented a glass tube on to the surface of linoleum, filled it with water, and observed if the level sank. He came to the conclusion that linoleum is practically waterproof, and did not observe any difference between different makes. This method does not recommend itself to me on account of the very limited area examined. Some foreign governments subject the linoleum to the action of salt water at 80° C. for six hours and observe the appearance of the treated material, which they stipulate should not show any blisters. It is difficult to see what bearing this has upon the everyday applications of linoleum. In my opinion such a treatment would give a premium to the poorer and more porous qualities of linoleum, for if the linoleum presented a closed and impervious surface, then the heat, by expanding the gases and air enclosed in the linoleum, would cause blisters. I think I have devised a method for the examination of the action of water upon linoleum, which gives more reliable results and which enables one to detect differences in samples of which the already discussed tests, with the exception of the moisture present test, give no indication: differences which, however, show themselves very distinctly when the linoleum is in actual use.

Water Absorption Test.—This consists in soaking pieces of linoleum in water at say 15° C. for a given period, 24—48 hours, and for a longer period, two to seven weeks. In carrying out the test the canvas back is removed, and the back of the linoleum layer rasped smooth with a file. A piece of the linoleum of about 50 sq. cm. area is dried in the water oven and weighed. The drying renders any wax which may have been used in facing the linoleum fluid, and causes it to sink into the interior of the fabric, thus opening up the pores for the freer action of the water. The linoleum is then placed in water for a given period, removed, dried between filter paper and weighed. The increase in weight gives the water absorbed, and other things being equal, this is a measure of its value.

In carrying out the tests all the samples to be examined should as far as possible be immersed together so that the results may be comparative, avoiding any disturbing influences arising from fluctuation of temperature.

Sample.	Kind of Linoleum and Cement used.	Weight per square inch in		Total thickness in	Lino thickness in	Moisture present.	Ash content.	Ether extract.	Water absorption per cent. in			
		Total.	Lino. only.						24 hours.	48 hours.	15 days.	7 weeks.
	PLAIN:—	grms.	grms.	mm.	mm.							
1	Oxidised oil.....	2.20	2.03	3.6	3.10	1.3	13.6	19.5	2.2	2.9	7.4	12.6
2	" ".....	2.47	2.07	3.3	2.70	1.46	24.2	16.9	2.5	3.5	10.4	18.0
3	" ".....	2.60	2.21	3.7	3.15	1.60	17.65	18.2	2.2	2.9	7.4	12.6
4	Polymerised oil.....	2.42	2.01	3.6	3.1	1.58	14.9	17.8	2.7	3.7	10.2	17.2
5	Oxidised oil.....	3.30	2.87	4.8	4.4	1.30	15.1	..	2.5	3.3	8.5	14.5
6	" ".....	1.30	1.27	2.2	1.75	1.5	18.1	17.7	3.7	4.9	12.0	18.5
7	" ".....	1.52	1.15	2.2	1.90	2.5	10.5	23.3	7.3	9.5	20.0	30.5
8	Polymerised oil.....	1.52	1.08	2.2	1.75	2.5	?	..	5.5	7.1	15.8	20.3
	CORK CARPET:—											
9	Polymerised oil.....	2.65	2.35	7.4	7.1	1.73	7.6	..	7.8	10.8	29.0	43.5
10	Oxidised oil.....	3.52	3.24	7.05	6.65	1.26	14.9	..	3.75	4.6	16.2	24.5
11	" ".....	2.70	2.34	5.35	4.8	2.25	13.3	22.3	8.0	10.5	27.5	46.2
	PRINTED LINO:—											
12	Oxidised oil.....	2.53	1.90	3.7	2.9	1.6	..	..	3.45	4.75	11.0	..
	INLAID:—											
13	Oxidised oil cement.....	2.56	1.7	3.15	2.2	1.7			4.8	6.3	16.0	21.5
14	" ".....	2.48	1.54	3.10	2.1	1.85			..	8.5	18.0	..
15	" ".....	2.28	1.65	3.0	2.3	1.5			3.0	5.5	11.9	..
16	" ".....	1.98	1.25	2.45	1.7	1.4			5.4	7.1	17.7	24.2
17	" ".....	1.64	0.93	2.1	1.2	1.6			7.3	9.8	21.3	28.5
18	" ".....	2.35	1.88	2.9	2.45	1.46			..	8.3	18.0	..
19	" ".....	1.53	1.03	2.15	1.45	2.6			..	16.0	23.5	..
20	" ".....	2.25	1.70	3.0	2.3	2.25			..	16.0	23.6	..
21	" ".....	2.91	2.10	3.6	2.7	1.96			..	12.9	23.5	..
22	" ".....	2.00	1.41	2.8	2.15	4.1			..	23.4	32.3	..
23	" ".....	1.98	1.51	2.7	2.15	2.6			..	18.0	26.5	..
24	" ".....	2.68	1.64	3.55	2.40	4.3			..	26.4	37.0	..

It has been said that the results are a measure of the value of the linoleum. This is the case because they are an indication of its porosity. A large water absorption means a high porosity, and great porosity may indicate that the granules of the linoleum are not cohering sufficiently and consequently may be more easily removed by wear. It also shows that there is a likelihood of a free entrance of particles of dirt into the material, causing it to wear dirty. As many soaps are more or less alkaline in character a porous linoleum when washed stands a greater chance of having its binding material, oil and resin, dissolved by those alkaline fluids and thus is more likely to disintegrate.

When used in places where weight is an important factor, as on board ship, it is obvious that a porous linoleum is likely to retain more moisture than a less porous one, and hence is less suitable. In judging the linoleums by this test it is important to bear in mind that only those kinds of linoleums which belong to the same class should be compared, and not only that but the thickness should also be the same. I have found that the thicker qualities absorb less per cent. of their weight than the thinner, as they present less surface.

It would also be absurd to compare inlaid or plain goods with printed goods, because the water absorption is in this case given by the linoleum mass and is not a measure of the wearing qualities of the paint layer, which is practically waterproof. Neither would it be fair to judge the wearing qualities of cork carpet as against plain or inlaid on this test. The larger grains of cork used in cork carpet present a greater surface to the action of the water and hence more is absorbed, but the very fact that the cork grains are larger makes the fabric more resilient and therefore less likely to wear. Cork carpet as a matter of fact wears practically as long as plain or inlaid linoleum.

With these reservations the writer considers that a determination of the water absorption of two samples of linoleum belonging to the same class is one good means of determining their relative wearing properties and values.

In the table the results of the examination of samples representing the makes of eight different firms (six British, one American, and one German) are given. They were obtained from samples which the author still retains and must be considered as applying to these only, although in selecting them he has as far as possible made them representative of all the samples he has examined.

In conclusion he would urge that the result of no single test is sufficient to rely upon. Before coming to a decision as to the suitability of a sample of linoleum for any purpose the conditions under which it is to be used should be considered and the tests applied to this end.

In conclusion the author has to thank his assistant, Mr. Ernest Wake, for valuable practical help.

DISCUSSION.

Mr. S. STEWART said that when a large amount of pigment was necessarily used to get the desired colour, a greater proportion of cement would also be used, and so to a certain extent neutralise the tendency to harden the goods. In regard to the attrition test, he drew attention to the results given in this J., 1895, p. 587, by Burchartz, where, under equal conditions of experience, the following amounts of material were removed from 50 sq. cm.:—Linoleum, 1.8 c.c.; granite, 4.4 c.c.; marble, 24.3 c.c.; and oak, 7.8 c.c. These results showed the absurdity of comparing such different materials by such a test. Referring to the attempt to determine the amounts of cork and cement in linoleum samples, the problem at first also appeared to him easy, but his experience had been the same as Dr. Ingle's, and it was evident, from the results obtained that it was impossible to ascertain with any degree of accuracy, or even approximately, the relative proportions of cork and cement in linoleum by the saponification process, or by simple extraction with ether. In this connection he might supplement Dr. Ingle's results by giving the following figures obtained by treating the same sample of dried ground cork with alcoholic potash in an open basin, evaporating off the alcohol and treating with water:—

Insoluble after above treatment.	Insoluble in Ether after acidifying filtrate.	Soluble in Ether.	Soluble in Water (by diff.)	Ash.
Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
36.80	10.80	27.60	23.15	1.65
33.30	11.65	25.80	27.60	1.65
33.45	7.80	28.20	30.90	1.65

By treating the same dried cork with alcoholic potash in flask, with reflux condenser, and washing with alcohol, the following results were obtained:—

Dried Cork treated with Alcoholic Potash and washed with Alcohol.

Per cent.	Per cent.
Insoluble matter 71.92. Treated with water gave 32.62 insoluble, of which 29.82 was organic. Filtrate treated with acid and ether gave 7.82 insoluble and 1.86 soluble in ether.	Soluble matter treated with acid and ether gave 37.92 soluble in ether.

The fact that the sum of the insoluble in alcohol, 71.92, and the soluble in ether, 37.92, was 109.84, indicated that the insoluble in alcohol probably contained a considerable amount of potash. He had not separated the various products of the decomposition of cork so thoroughly as Dr. Ingle had done, as he was more concerned to discover a process for the analysis of linoleum than to undertake an investigation of the properties of such products. He agreed with Dr. Ingle as to the value of the determination of the ether extract when the class of cement used was known, as cements of different composition would give different amounts of ether extract. He had also made experiments on the absorption of water by linoleum, but found that the application of the test to the surface was no indication of the quality of the goods after the surface was removed. Removal of the canvas and paint from the back and immersion in water was better, as it was in a way the measure of the porosity of the material; but although that was the case he could not agree that it was a criterion of quality, because upon the porosity of the cork depended its resiliency, and consequently the special quality which linoleum had as a floor covering, unless fabrics of the same class were compared.

Mr. BRODIE said that he had found that, if linoleum were porous, the paint used in printing it dried dull, and the linoleum layer under the paint was brittle. He could confirm Dr. Ingle's experience in regard to the variations in the porosity of different samples.

Mr. R. T. THOMSON said that, like the previous speakers, he had experienced great difficulty in analysing linoleum, and the results recorded in the paper explained this. He asked whether polymerised oil gave the same analytical results as the oxidised oils.

Dr. L. DOBBIN asked whether there was any test for the quality of linoleum that was really reliable. He also commented upon the saponification of cork, and thought that decomposition might take place. He, too, had been unable to get any reliable results with linoleum. He did not consider the water-absorption test a measure of the wearing power as Dr. Ingle applied it; it should be applied to the surface only. Could not the cellulose content of the cork be used as a guide to the amount of cork present in a sample?

The CHAIRMAN mentioned that chloroform extracted a considerable amount of material from cork, and pointed out how unsuitable corks were to close bottles for containing such substances as alcohol, ether, and chloroform. He considered that the attrition test was probably the best test to apply, if sand or some less drastic substance than emery were used. In saponifying cork, probably the alcoholic potash decomposed the cellulose itself.

Dr. INGLE, in reply, said he agreed with the chairman with regard to the attrition test, but it was so difficult to apply, and required so costly machinery as to put it out of

court. He was glad to have Mr. Stewart's confirmation of his experience with regard to the saponification of cork. Mr. Stewart's results did not altogether agree with his own, but that was doubtless due to variations in the composition of the cork examined. With regard to the difference between saponification in the open test and with a reflux condenser, he considered that suberine was probably more closely allied to the resins than to cellulose, and, as Fahrion had observed, when resin was saponified in an open vessel, different results were obtained than when the operation was carried out with a reflux condenser, the oxygen of the air oxidising the resin at the double linkages. Cork gave, on treatment with potash, an unsaturated compound which would probably suffer similar oxidation. Hence the difference in the results. In reply to Dr. Dobbin, he was afraid that, as cork varied so much in composition, the cellulose present in a sample of linoleum was an uncertain guide.

He knew of no single test that could be used to determine the value of a sample of linoleum. The water absorption test had been criticised. He did not lay too great a stress upon it, as it did not take into account the resilience of the material. It was, however, a measure of the porosity. As to the relationship between porosity and wearing power, that was an arguable matter. Dr. Dobbin considered it should only be applied to the face, but he would point out that after the facing had worn away the interior portions of the linoleum became exposed, and the test, as applied, seemed to him to give an average result for the porosity of the goods. In reply to Mr. R. T. Thomson, fabrics made from polymerised oil gave less ether extract than those made from oxidised oil cement. With regard to the action of chloroform upon cork, he had not tried it, but he did not think the results would be materially different from those obtained with alcohol and ether.

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I.—PLANT, APPARATUS, AND MACHINERY.

Registering Pyrometer; New Form of —. N. S. Kurnakow. *Z. anorg. Chem.*, 1904, 42, 184–202.

THE apparatus described is claimed by the author as simpler than that of Roberts-Austen (this J., 1892, 840; 1897, 5), and the process consists in principle in measuring the temperature by means of a thermo-element connected to a mirror-galvanometer, and recording the temperature by causing the light reflected from the mirror-galvanometer to fall on to a silver-bromide paper fixed to the surface of a rotating cylinder. The cylinder is caused to revolve by clockwork, and by means of cog-wheels of different sizes the time occupied by a complete revolution can be varied from $\frac{1}{2}$ hour to 24 hours. The divisions on the scale are reflected from the movable mirror-galvanometer, and are read off by means of a telescope. At one end of the cylinder of the registering device a strip of metal is fixed, which, at the end of each revolution, comes in contact with two brass springs, and thus completes an electric circuit, in which a bell is included. In a branch of the same circuit is an electromagnetic key, which starts or stops the clockwork.—A. S.

ENGLISH PATENTS.

Drying Apparatus; Impts. in —. A. Van Steenkiste, Schaerbeek-Brussels, Belgium. Eng. Pat. 27,935, Dec. 19, 1903.

THE arrangement of the frames in the drying chamber in an inclined position is claimed, this arrangement being effected by applying to the top and bottom of the frames, rollers travelling on guides or rails fixed to the floor and roof of the chamber. The claims also extend to cross-bars, which are arranged on the fronts or faces and backs of the frames of the drying apparatus, for holding the material to be dried, and for supporting the frames one against the other.

—W. H. C.

Separating Liquid from Solid Matter; Apparatus for — and for partially Drying the Solid Matter. T. Houghton and the United Alkali Co., Ltd., Liverpool. Eng. Pat. 28,791, Dec. 31, 1903.

THE rotating dish with filter-bottom, described in Eng. Pat. 7957 of 1903 (this J., 1904, 434), has the dish divided into compartments, which are alternately in communication with the suction device, to carry away the filtrate, and with a

supply of mother liquor, water, &c., to wash the solid matter and filtering medium, this device and arrangement being the subject of the claims.—W. H. C.

Centrifugal Separators; Impts. in — S. C. Hauberg, Copenhagen. Eng. Pat. 2002, Jan. 26, 1904.

IN a centrifugal separator, in which the bowl rests freely on the head of the revolving spindle, a pawl is arranged on the head of the spindle in such a manner that, when the spindle is revolving faster than the bowl, the pawl comes into action by centrifugal force and both are connected together. If, however, the bowl revolves faster than the spindle, the pawl ceases to act. This arrangement is claimed.—W. H. C.

Volatile Liquids; Apparatus for Measuring Quantities of Highly — F. W. Branson, Leeds. Eng. Pat. 3490, Feb. 12, 1904.

A GRADUATED tube, intended to receive and measure the highly volatile liquid, is sealed at its rim to the edge of an enclosing tube, and the space between the two tubes is rendered vacuum, thus supplying a vacuum jacket, and protecting the liquid to be measured, from access of heat. A removable delivery stopper is fitted into the inner tube, and the outer tube is enlarged below so as to form a foot, so that the apparatus may be set to stand upright.—E. S.

Raising Liquids by Means of Compressed Air; Process and Appliance for — G. Hantke, Warsaw, Poland. Eng. Pat. 16,316, July 23, 1904.

SEE FR. Pat. 345,904 of 1904, following these.—T. F. B.

Vacuum Evaporating Apparatus. T. Suzuki, Sunamura, Japan. Eng. Pat. 19,186, Sept. 6, 1904.

A SERIES of cylindrical chambers are superposed one upon the other, and are provided with a base and top piece. Each chamber is provided with an easily removable, vertical series of horizontal heating coils, so arranged that the liquid falls between the pipes of an upper coil on to the surface of the pipes forming the coil immediately below. A distributing disc is arranged above the series of coils in each chamber, and is provided with overflow pipes and impact surfaces, so that the inflowing liquid, impinging on the latter, causes the distributor to rotate. Means are provided for feeding the apparatus with liquid, for allowing the liquid to flow from chamber to chamber, for withdrawing the same when concentrated, for connecting the apparatus to the vacuum pump, and for utilising the heat of the vapour produced in one chamber to evaporate the liquid in another. Seven claims cover the foregoing.—W. H. C.

UNITED STATES PATENTS.

Centrifugal Machine. J. J. Berrigan, East Orange, N.J., Assignor to F. J. Arend, New York, and to J. Bernstrom, Stockholm. U.S. Pat. 774,821, Nov. 15, 1904.

THE rotating drum of a centrifugal machine is provided with an outlet for the liquid separating, and with an outlet situated in its circumference for solids. The outlet for the solids is surrounded by bars projecting inwards, and the solids are swept towards it by arms carried by a rotating shaft fixed eccentrically in the drum.—L. F. G.

Centrifugal Machine. A. C. Van Kirk, Tiffin, Ohio. U.S. Pat. 775,320, Nov. 22, 1904.

A VERTICAL conical chamber is mounted so as to rotate, and within it is a screw-blade arrangement rotating concentrically with the chamber, but at a different speed. At the bottom is a discharge opening for the solid matter, whilst the liquid is discharged from an opening in the top, near the centre. The material to be treated is fed into the top of the chamber, a shield being arranged to prevent any solid matter being discharged through the liquid outlet. Means for rotating the chamber and screw, and for varying the speed and controlling the same, are provided, the whole forming the subject of the claims set forth.—W. H. C.

Discharge-regulating Device for [Centrifugal] Separators. J. J. Berrigan, East Orange, N.J., Assignor to the De Laval Separator Co., New Jersey. U.S. Pat. 775,510, Nov. 22, 1904.

SECURED to and passing through the wall of the rotating bowl of the separator is a tube, inside which a liquid-discharge tube is loosely mounted, extending inside the bowl beyond the outer tube. A ring is so arranged that, when the bowl rotates, the vertical movement of the ring in one direction forces the liquid-discharge tube against the action of centrifugal force, whilst the movement of the ring in the other direction regulates and limits the extent to which the tube can be forced outwards by centrifugal force.—A. S.

Separating Non-Gaseous Material from a Mixture with Gaseous Material. A. G. McKee, Cleveland, Ohio. U.S. Pat. 774,851, Nov. 15, 1904.

THE apparatus employed, consists of an upright pipe projecting into an outer pipe. The outer pipe is enlarged at its upper portion above the inner pipe, and inside the enlargement is fixed a rotating fan. The mixture to be separated enters at the top, and the non-gaseous material fall into the annular space between the two pipes, and are removed through a shoot, whilst the gases flow through the inner pipe to a lateral exit.—L. F. G.

Drier. J. E. Turney, Louisville, Ky., Assignor to C. E. Geiger, W. E. Koop, and G. W. Fiske, of Geiger, Koop, and Fiske, Louisville. U.S. Pat. 774,859, Nov. 15, 1904.

THE apparatus consists of an approximately horizontal cylinder with a double or hollow wall, the annular space formed, being divided into a series of flues by longitudinal partitions. Receiving and discharge heads are fixed at the ends of the cylinder, which is suitably rotated, and the material to be dried is fed into the longitudinal flues from a conveyor, whilst a heating medium is admitted through the central portion of the cylinder.—L. F. G.

Drier. J. E. Turney, Louisville, Ky., Assignor to C. E. Geiger, W. E. Koop, and G. W. Fiske, of Geiger, Koop, and Fiske, Louisville. U.S. Pat. 774,860, Nov. 15, 1904.

THE apparatus is similar to that described in the preceding patent, except that the longitudinal flues are formed by attaching a series of troughs of rectangular section to the inner wall of the rotating cylinder.—L. F. G.

Drier. T. Andrews and S. J. Loewenthal, Rockaway, N.J., U.S. Pat. 775,717, Nov. 22, 1904.

A HORIZONTAL drying cylinder is mounted concentrically within an outer cylindrical case, a space being left between them for the circulation of the heating agent. A steam turbine, fixed at one end of the inner cylinder, is driven by the steam or other heating fluid, and causes the cylinder to rotate on its axis. Means are provided for introducing and discharging the steam. The claims cover a drying cylinder thus constructed and arranged.—W. H. C.

Kier; Vomiting — E. D. Jefferson, Lowell, Mass. U.S. Pat. 775,450, Nov. 22, 1904.

A CLOSED kier is claimed, adapted to contain liquor under pressure, and having a "vomiting pipe" connecting the top and bottom of the kier. The vomiting pipe, by automatic arrangement, is actuated intermittently and independently of the pressure in the kier.—W. H. C.

Vacuum Evaporating Apparatus. C. Ordway, Brooklyn, N.Y. U.S. Pat. 775,577, Nov. 22, 1904.

A VACUUM pan is combined with a set of feed and settling tanks. The concentrated liquid flows from the vacuum pan to the settling tanks, and deposits the separated solid matter, which is removed, the liquid being then returned to the vacuum pan. Means are provided for controlling the feed.—W. H. C.

Heating Liquids; Method of — A. Waldbaur, Stuttgart, Germany. U.S. Pat. 775,788, Nov. 22, 1904.

SEE Eng. Pat. 15,875 of 1904; this J., 1904, 928.—T. F. B.

FRENCH PATENTS.

Temperature Regulators; Impts. in — N. E. Nash and W. E. Friedman. Fr. Pat. 345,090, Jan. 12, 1904.

A THERMOSTAT composed of two thin plates, one of orcelain and the other of nickel, is connected to a bent Bourdon tube. The latter is connected with a supply of compressed air. The Bourdon tube is provided with a valve-actuated by the thermostat. When this valve is opened, some of the compressed air escapes from the Bourdon tube, which then alters its shape, and actuates a valve controlling the supply of heating fluid to the radiator or other heating apparatus.—W. H. C.

Pyrometers; Impts. in — H. T. Barnes and H. M. Tory. Fr. Pat. 344,718, June 6, 1904.

THE apparatus consists of:—a resistance pyrometer of the usual kind, arranged in an electrical circuit in which two resistance coils are placed so as to divide the circuit into two portions; a scale formed of a wire of conducting material mounted in zigzag fashion on a suitable calibrated support; a movable conducting piece which can be brought into contact with the first wire at any position; and an arrangement for emitting sound, such as a telephone. When contact is made between the two conducting wires at a certain point on the scale, which point varies with the temperature to which the pyrometer is subjected, equilibrium is established between the two divisions of the circuit, and consequently no sound is produced in the telephone, whereas, when contact is made at any other point on the scale, sounds are produced. The scale may be calibrated to cover any desired range of temperature.—A. S.

Compound Gas Compressors. M. E. Douane. Fr. Pat. 344,686, July 8, 1904.

THE compressor is designed for compressing air or rare gases, and is very compact. In the double-compression type the cylinders are single-acting, and mounted in tandem on a vertical frame. The compressed air issuing from each cylinder is cooled by circulating in a metal coil placed in a vessel containing water, surrounding the two cylinders. In the triple-compression type, one single-acting cylinder is mounted in tandem with a double-acting cylinder, the third compression of the gas being effected in an annular cylinder by the return stroke of the piston.—L. F. G.

Measuring Apparatus for Methyl Chloride or other Volatile Liquids. A. Rousseau. Fr. Pat. 344,929, July 12, 1904.

A CYLINDRICAL double-walled vacuum vessel, provided with a foot, is graduated in cubic centimetres. Over the top is fitted a cover with a straight or curved nozzle, through which the liquid is poured out, a tight joint being made with the vacuum vessel by means of a cork ring.—L. F. G.

Heating Agglomerated Materials under Pressure; Furnace for — Galvanische Metall-Papier-Fabrik Act.-Ges. Fr. Pat. 344,791, July 13, 1904.

THE furnace is intended for heating under pressure granular and pulverulent agglomerates, such as carbon blocks, carbon ivnarno brushes, &c., up to a temperature of 1100° C. The materials are filled into the cylinders of a number of hydraulic presses arranged inside the furnace, and are pressed against the screw covers of the same. The furnace is heated by gas, which is admitted through orifices surrounded by air inlets, to two sides of each press. The products of combustion have to pass downwards before reaching the exit pipes. Means are provided for regulating the gas supply, and spy-holes for observing the temperature attained.—L. F. G.

Retort Furnace. Soc. P. de Lachomette, Williers et Cie. Fr. Pat. 345,010, July 21, 1904.

THE Lachomette system of regenerative heating is modified by providing two sets of paths or flues for the waste flames, and for the secondary supply of air. Further, a portion of the secondary supply of air is made to enter the spaces

between the outer rows of retorts and the walls of the furnace, whereby the retorts in these rows are heated to a higher temperature, and a more uniform distribution of heat in all parts of the furnace is attained.—A. S.

Siphoning Liquids by Means of Compressed Air. G. Hantke. Fr. Pat. 345,204, July 23, 1904.

AN accumulator is interposed between the air-compressor and the vessel containing the liquid. The air in the accumulator is compressed to a high degree, and is then passed through a reducing valve, and used at a lower pressure, whereby a steady flow of liquid is maintained.—W. H. C.

Filter for all Kinds of Liquids. A. F. Capillary. Fr. Pat. 345,118, July 25, 1904.

THE filter claimed consists of a number of vertically superposed filter-plates, with suitable base and top pieces. The plates are perforated and separated by filter-paper or cloth, and clamped together by a screw. The inlet and outlet pipes are cast in the border of the plates. A specially constructed core, which can be withdrawn from the casting in parts, is used to form the lateral channels communicating with the interior of the plates. The plates are made of any metal suitable for the liquid to be filtered, and the base and top pieces, which are of cast iron, are protected by a coating of the same metal.—W. H. C.

Pressure Filter, with Rapid Attachment and Concentration of Filtering Surfaces. J. Selves and U. Tocaven. Fr. Pat. 345,516, Aug. 18, 1904.

A CYLINDRICAL chamber is supported by trunnions on a suitable carriage. The filter-bags are retained within the cylinder by a special holder, which is attached to the cover-plate of the cylinder by an interrupted screw-joint, which can be rapidly put into or taken out of position. The filter-bags are tied at the lower end with a cord, thus causing them to form into several vertical pleats. They are surrounded by wire netting or open wickerwork shields in order to prevent them from expanding too far.—W. H. C.

Filter Press (Continuous) composed of Single Elements. P. M. Privat. Fr. Pat. 339,054, Sept. 22, 1903.

THE apparatus consists of several filtering elements, joined by means of tubing to several taps fixed to a distributing valve. This distributing valve is spherical, and divided into two compartments by a partition. The one compartment receives the liquid to be filtered, and the other the filtered liquid. By means of the taps the admission of liquid to each element can be controlled, and a defective element isolated.—L. F. G.

Drying Apparatus. Rheinische Webstuhl- et Appretur-Maschinenfabr. G. m. b. H. Fr. Pat. 345,303, Aug. 2, 1904.

SEE Eng. Pat. 17,957 of 1904; this J., 1904, 1020.—T. F. B.

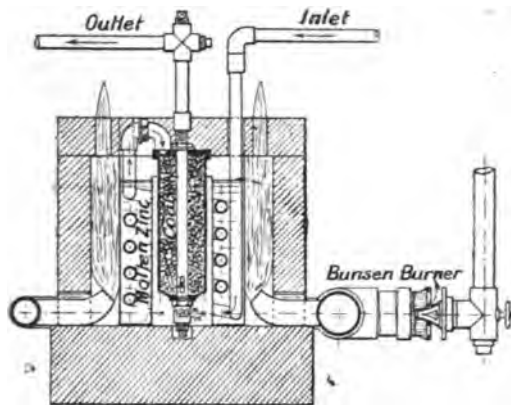
II.—FUEL, GAS, AND LIGHT.

Coal; Spontaneous Ignition of — A. O. Doane. Eng. News, 1904, 52, 141; Science Abstracts, B., 1904, 7, 940—941.

THE amount of moisture present in a bituminous fuel after drying in the air, is stated to be a measure of the risk of spontaneous ignition when the fuel is stored; bituminous coals containing over 4.75 per cent. of water are dangerous. Coal bins should be of iron or steel protected by concrete, and should be roofed over; free air passages should be provided round the walls and beneath the bins to keep them cool; the depth of coal stored in them should never exceed 12 ft. The customary method of providing air passages in the body of fuel is useless, since it only tends to accelerate oxidation, and does not produce a sufficient current of air to keep the temperature down. Cracks or joints in the walls of the fuel bin increase the risk of spontaneous ignition for similar reasons.—T. F. B.

Gas; Distillation of Coal for — by Highly-Heated [Water] Gas. E. Blass. *J. Gasbeleucht.*, 1904, 47, 986—987.

THE destructive distillation of coal by means of a current of highly-heated water-gas has been investigated with the aid of the apparatus shown in the accompanying figure:—



The inner, iron cylinder was filled with the coal, and was surrounded by molten zinc in which was immersed the heating coil. The water-gas used, traversed first the heating coil and then the coal, and was next led through dilute sulphuric acid for the determination of the ammonia. (It was found that coal-gas suffered no loss of illuminating power when passed through the coil even at the temperature of boiling zinc (about 900° C.).) 300 grms. of coal were distilled in a current of water-gas at 672°—705° C., until the gaseous mixture produced ceased to give a luminous flame and appeared to consist of pure water-gas. The yield of ammonia was found to exceed, by 62 per cent., that obtained on carbonisation of the coal in ordinary retorts; as ammonia is completely expelled only at 900°—1000° C., the yield would have been greater had the apparatus been capable of withstanding that temperature. The quantity of water-gas required was about double that obtainable from the coke (68 per cent.) yielded by the coal. The yield of actual lighting gas was four or five times that given by ordinary distillation, and although the average illuminating power was not equal to that of ordinary coal-gas, it shows that a considerable volume of water-gas can in this way be carburetted by a relatively small quantity of coal. The gas was fully equal to ordinary gas for heating, cooking, and power uses, and for employment with the incandescence burner. A number of theoretical considerations show that the coke produced per kilo. of coal, is not sufficient to yield all the water-gas required for the distillation of the coal (compare following abstract).—H. B.

Gas; Distillation of Coal for — by Highly-Heated [Water-] Gas. E. R. Besemfelder. *J. Gasbeleucht.*, 1904, 47, 1083—1084.

THE author criticises the remarks of Blass (see preceding abstract), and maintains that the yield of coke is about twice as much as is required for the distillation of the coal. In the author's process, a number of water-gas producers are united to one common distillation retort, which operates uninterruptedly and feeds the incandescent coke continuously to the particular producer in action at the time, through the opening by which the hot water-gas is flowing into the distillation retort from the producer. The number of producers undergoing the air-blast is controlled automatically by the distillation retort, so that a supply of hot waste gases flows continuously round the retort, heating it from the outside. The coal and the gases pass through the retort in opposite directions. Less than half the coke produced, is sufficient for the carbonisation of the coal, and hence the proportion of water-gas contained in the illuminating gas produced is less than in the experiments of

Blass, the luminosity of the flame and the calorific value of the gas being correspondingly greater.—H. B.

Naphthalene in Coal Gas; Formation of —.
A. H. White and S. Ball. XXIII, page 1240.

ENGLISH PATENTS.

Peat; Process for Converting Raw — into Solid Peat Fuel. C. Schlickeysen, Steglitz, Germany. Eng. Pat. 4995, Feb. 29, 1904.

THE raw peat "as it is taken from the bog" is incorporated, in a mixing and kneading machine, with pulverulent, granular, or fibrous substances, such as peat dust, spent tan, road sweepings, powdered ore and the like, and is then made into blocks. The blocks are, preferably, coated on the surface with pulverulent, granular, or liquid substances, to aid the retention of which the mixture, on issuing from the kneading machine, may be first pressed through a heated mouthpiece, so as to heat the surfaces of the bars to about the boiling-point of water, before applying the coating substance.—H. B.

Gas Producers. L. Mond, London. Eng. Pat. 27,496, Dec. 15, 1903.

IN a gas producer of the kind described in Eng. Pat. 12,440 of 1893 (this J., 1894, 938), the blast is supplied through a circular grate having the form of an inverted truncated cone. According to this specification, a blast-pipe passes axially up through the conical grate, the open end being covered with a hood, to prevent any fuel from entering it. The blast of air, steam, or air and steam, is delivered in two portions, one of which passes up through the blast pipe, whilst the other is led down the annular space between the two concentric casings of the producer, to enter through the conical grate.—H. B.

Gas Producers and Steam-Generators for Producing Water-Gas and Generating Steam by the Heat of such Gases; Combined Double —. F. Neuman, Eschweiler, Germany. Eng. Pat. 21,318, Oct. 4, 1904. Under Internat. Conv., Oct. 20, 1903.

TWO alternately operated producers for the generation of water-gas and producer-gas are so connected to a common tubular steam boiler, divided longitudinally by means of a partition, that the producer-gas generated in the one producer, and the water-gas simultaneously generated in the other producer are made to traverse the steam boiler simultaneously, but separately from each other, for the purpose of keeping the boiler at the same temperature throughout the alternating water-gas and producer-gas periods, and maintaining a uniform production of steam.
—H. B.

Gas Producers. J. Robson, Shipley, Yorks. Eng. Pat. 22,092, Oct. 14, 1904.

THE vertical fire-brick lining of the producer is recessed above the fire-grate, round the region of incandescence, and in the recess there is fitted an annular metal channel through which the supply of air and steam is made to circulate before passing up through the fire-bars. By this means the mixture of steam and air is superheated, and the adhesion of clinker to the walls at the incandescent zone is prevented by the cooling action of the current within the annular channel.—H. B.

Gas and Air Mixing Apparatus. C. C. Dodge, New York. Eng. Pat. 21,776, Oct. 10, 1904.

INSIDE an outer drum there are arranged, upon a common horizontal shaft, a gas-meter drum and an air-meter drum, constructed with helical compartments adapted to be immersed in water, on the usual principle. The two meter drums are driven by means of the gas pressure within the gas-meter drum, the air and gas which are delivered at the inner ends of the two drums being mixed within the outer drum and passing thence through an outlet pipe. In order to reduce the friction on the shaft-bearing, each meter drum has a central closed chamber, serving as a buoy, attached to the shaft, and the blades forming the helical

compartments are attached to the periphery of this chamber. Instead of a stuffing-box at the central point where the gas inlet-pipe enters the gas-meter drum horizontally, a water sealing device is provided, consisting of a concentric sealing chamber on the end of the drum, embracing a concentric disc secured vertically on the gas inlet-pipe.—H. B.

Lighting Purposes; Bodies Adapted for — and Rendered Incandescent by Heat or Electricity. J. H. Ladd, Reigate, Surrey. Eng. Pat. 25,698, Nov. 24, 1903.

FLINTS are heated at 4000°–6000° F. (from 2204° to 3316° C.) to expel "metallic elements," ground to powder, mixed with tar and cement or the like, kneaded into a dough with water, and moulded into the desired shape. If moulded to the shape of an incandescent mantle, the latter is perforated with small holes, dried slowly, impregnated with salts of the rare earths, &c., dried, and baked at a high temperature. The dough can also be made into electric lamp filaments.—H. B.

Mantles of Incandescent Gas Burners. T. K. Johnson and W. McKean, Glasgow. Eng. Pat. 753, Jan. 12, 1904.

To strengthen and increase the lighting power of mantles, they are dipped into a solution of "sulphate of alum," and dried.—H. B.

Electrodes for Arc-Lights. F. J. Gerard and L. Fiedler, London. Eng. Pat. 6972, Mar. 22, 1904.

THE electrodes contain a small proportion of lanthanum and of thorium, the ratio of the lanthanum to the thorium lying between 20 : 80 and 70 : 30. They are conveniently prepared by adding to the graphite employed, from 1 to 5 parts per 1000 of the nitrates of the earths in aqueous solution, drying, adding the usual binding ingredients, and proceeding in the ordinary way. The thorium may be replaced partly by zirconium. Two electrodes may be used together, in which the one contains the lanthanum, with or without zirconium, whilst the other contains the thorium, with or without zirconium. Cheaper forms of electrodes are made by adding, instead of rare earths, magnesium and aluminium, or their compounds, in approximately equal proportions.—H. B.

UNITED STATES PATENTS.

[Oil] Gas Generator. F. S. Vincent, Petoskey, Mich., Assignor to R. J. Lyon, Salt Lake City. U.S. Pat. 774,802, Nov. 15, 1904.

A RESERVOIR, containing liquid hydrocarbon, is supplied with compressed air by means of a hand-pump, and is connected to a generator consisting of an upright tubular casing, containing a sheet-metal spiral and heated by a burner placed beneath the generator. A feed-pipe for the generator is connected to the lower part of the reservoir, and is formed with a loop passing round the burner, so that the hydrocarbon is heated on its way to the generator. The feed pipe and upper part of the generator are connected to the top of the reservoir, whereby an even pressure is maintained. The gas produced in the generator is directed through a nozzle into a mixing chamber, wherein it mixes with air, and flows thence into the gas main. A branch pipe from the gas main supplies the gas required by the heating burner.—H. B.

Gas Producer. H. L. Dixon, Assignor to H. L. Dixon Co., Pittsburg. U.S. Pat. 775,265, Nov. 15, 1904.

THE producer consists of a number of adjoining, water-sealed chambers, each pair of which has a common intermediate vertical wall. "Grated" air-passages are formed in the inner sides of the vertical walls of the chamber.—A. S.

Gas Generator. A. Weighlé, Töss, Assignor to Schweizerische Locomotiv- und Maschinenfabrik, Winterthur, Switzerland. U.S. Pat. 775,641, Nov. 22, 1904.

SEE Eng. Pat. 5798 of 1903; this J., 1904, 316.—T. F. B.

Centrifugal Gas Purifier. A. Steinbart, Carlstadt, N.J. U.S. Pat. 775,462, Nov. 22, 1904.

A ROTARY fan is mounted within a vertical "circular" casing; a concentric annular plate surrounds the fan a short distance from its circumference, and forms an annular chamber with the casing, from which water is injected into the path of the fan tangentially to its circumference. The casing has an outward enlargement at the centre of each side; a tapering gas-inlet tube, having its end curved spirally, being connected to one side, and a flaring outlet-pipe, likewise having its inner end curved spirally, communicating with the other side.—H. B.

Centrifugal Gas-Purifier. F. V. Matton, Riverton, Assignor to Camden Iron Works, Camden, N.J. U.S. Pat. 775,738, Nov. 22, 1904.

A ROTARY fan disc is provided on both sides with blades having recesses, the blades on one side being shorter than those on the other. The fan casing carries inwardly extending lugs, arranged in circular series, against which particles carried by the gas are projected by the action of the blades, the recesses in which register with the lugs when the fan rotates. Water is projected against the fan from one or more nozzles passing through the casing.—H. B.

FRENCH PATENTS.

Briquettes to resist Atmospheric Influences and to bear Transport, &c.; Process and Apparatus for the Manufacture of Solid —. G. Höpfer. Fr. Pat. 344,926, June 23, 1904.

THE briquettes formed are said to burn without smoke, soot, or sulphurous fumes. The finely-ground fuel is intimately mixed with lime (slaked or unslaked) and the requisite quantity of water, in a long, horizontal cylinder provided with mixing blades. The mixture sets to a pasty mass, which passes into a vertical, cylindrical moulding machine, provided with an endless screw, where it is subjected to a gradually increasing pressure. The moulding machine ends below in an outlet chamber, the walls of which are kept wet by a stream of water, and below this are an automatic cutting blade and a conveyor which carries the briquettes to a drying chamber, where they are dried in an atmosphere containing carbon dioxide.—A. S.

Fuel; Artificial —, and Method of Making the same. P. Grayson. Fr. Pat. 345,474, Aug. 10, 1904.

COAL, in a state of fine division, is mixed with water, rosin, or pitch, plaster-of-Paris, lime or cement, and mineral oil, with or without addition of sand and sawdust. The dry materials may be mixed separately, one portion with water and another with mineral oil, and then the two mixtures incorporated; or the dry materials may be mixed with the water, and the mass incorporated with a hot mixture of the mineral oil and rosin or pitch.—A. S.

Gas Generators; Impts. in —. J. J. Deschamps. First Addition, dated Oct. 13, 1903, to Fr. Pat. 332,745, June 3, 1903.

SEE Eng. Pat. 12,221 of 1904; this J., 1904, 929.—T. F. B.

Gas Generators. J. J. Lafond, Fr. Pat. 339,097, Oct. 14, 1903.

AN annular tuyère or trough is provided round the lower part of the combustion chamber. Hot water, supplied by a small boiler situated at the top of the generator in the path of the hot gases, enters the annular tuyère, and the steam issuing upwards therefrom, prevents the adhesion of clinker to the walls of the generator. In order to prevent the main current of gas from interfering with the cooling action of the steam at the sides, the usual supply of air and steam is admitted by a central blast-pipe at the base of the generator, and the gas produced, is led off by a central conduit (enclosing the small boiler mentioned above) depending into the generator.—H. B.

Generator for Purified Weak Gas. L. Heinén.
Fr. Pat. 344,859, Jan. 26, 1904.

THE generator comprises a vertical combustion-shaft, the lower part of which is slightly curved, and is provided with a fire-grate and an ash-pit having a slide for letting the ashes drop out; an observation plug at the top of the shaft; a fuel reservoir at the top and to the side of the shaft, having a helical blade for feeding the shaft with the fuel; and a water-regulating device for supplying water and air to a coiled pipe, surrounding the top of the shaft, and immersed in the hot gases produced, which furnishes a mixture of steam and air to be admitted at the foot of the shaft. The hot gases, on leaving the producer, encounter an inwardly directed spray of water, and then pass down a vertical pipe, at the foot of which the heavier solid impurities collect. The lighter particles, becoming wetted by the condensing steam, adhere to the wet surfaces of the fan through which the gases pass on their way to a coke filter and gas-holder.—H. B.

Gas Generators [using Oil and Steam]. Construction Company. Fr. Pat. 345,095, June 27, 1904.

A MIXTURE of vaporised oil and superheated steam is converted, by heating, into a fixed gas consisting of water-gas and gaseous hydrocarbons. The apparatus used is characterised by a combination consisting of a mixing-chamber surrounding a hollow heating-chamber. The inner chamber is heated internally by means of superheated steam, and jets of heated oil and superheated steam are directed upon its surface, the mixture produced, being led off from the mixing chamber and passed through a retort wherein it is converted into fixed gas.—H. B.

Gas, Combustible, from Bituminous Fuel; Production of —. Soc. Anon. F. Krupp A.-G. Fr. Pat. 345,016, July 22, 1904.

THE main combustion chamber of the producer, which is provided with a grate and an inlet for air and steam at the bottom, is surmounted by a cylindrical charging-shaft, opening at its upper end into a covered hopper. Inlets for compressed air are provided in the charging-shaft, at the point where it opens out into the hopper. The gas off-take pipe leaves the producer at the shoulder formed by the junction of the charging shaft with the main combustion chamber, and this shoulder is provided with a series of poke-holes. The object is to maintain two zones of combustion, the one upon the fire grate, and the other at the top of the charging shaft, the latter being easily accessible for loosening the fragments of coal. The fresh coal, placed in the hopper, parts with its tarry matters in the upper zone of combustion, and is converted into coke by the time it reaches the main combustion chamber.—H. B.

Gas Producers. Soc. Menot Père et Fils et Deneuille. Fr. Pat. 345,466, Aug. 10, 1904.

AN annular steam-generator surrounds the fuel hopper at the top of the producer, and extends downwards some distance into the path of the hot gases. From the upper part of the steam-generator a pipe leads the steam down to the air- and steam-inlet at the base of the fuel chamber. When the water supplied to the steam-generator reaches a certain level, the excess overflows into a second pipe which delivers it into an annular box surrounding the incandescent portion of the fuel, and the steam here generated, mixes with that from the former pipe and enters the fuel chamber.—H. B.

Gases; [Automatic] Apparatus for the Analysis of —. A. Bayer. Fr. Pat. 345,321, July 29, 1904. XXIII., page 1239.

Gases; Process for Purifying, Absorbing, and Regenerating — by Centrifugal Force. E. Theisen. Fr. Pat. 345,418, Aug. 8, 1904.

See Eng. Pat. 8671 of 1903; this J., 1904, 434.—T. F. B.

Sulphur and Cyanides from Gas-Purifying Materials [Spent Oxide]; Process and Apparatus for Extracting —. J. J. M. Bécigneul. Fr. Pat. 345,071, July 23, 1904. VII., page 1216.

Filament of High Illuminating Power for Incandescent Electric Lamps. E. L. Frenot. Fr. Pat. 344,759, July 11, 1904.

A METALLIC or carbon filament is coated by dipping it several times into an alcoholic solution containing the following substances: sugar candy, thorium nitrate, cerium nitrate, cobalt nitrate, aluminium nitrate, and cream of tartar, and then drying it. The alcoholic solution is then placed in a flask and boiled, the vapours, which carry over mechanically a considerable proportion of the above-named substances, being led into a vessel in which is suspended the coated filament, kept incandescent by means of an electric current. The filament is finally carbonised as usual. An alternative process is to prepare a paste of the above-named substances, extrude it into a filament, and carbonise the latter as usual.—H. B.

Filaments for Incandescent Electric Lamps; Manufacture of —. A. de Madaillan. Fr. Pat. 345,012, July 21, 1904.

SALTS or oxides of thorium, cerium, &c., are incorporated with a pasty solution of cellulose and zinc chloride; the mixture is relieved of air-bubbles by subjecting it to reduced pressure, and is then extruded into filaments, which are placed in strong alcohol for two or three hours and then dried. They are next wrapped round blocks of graphite, placed in powdered plumbago, and heated for 30 hours at 2000° C., when they are ready for use.—H. B.

III.—DESTRUCTIVE DISTILLATION. TAR PRODUCTS, PETROLEUM AND MINERAL WAXES.

Transformer Oils. D. Holde. Mitt. königl. Materialprüfungsamt, 1904, 22, 147—150.

ACCORDING to the author, a transformer oil, i.e., one in which an electrical transformer is immersed to prevent sparks passing from one coil of wire to another, should have the following characters:—(1) It should be a pure, heavy mineral oil, having a flashing-point above 180° C. by the Pensky test or above 190° C. by the open test; (2) It should be completely free from acid, alkali, and water. (3) It should have as low a viscosity as possible, and in any case not higher than 20 by the Engler test, compared with water at 20° C. (4) It should remain liquid when cooled below 0° C.—A. S.

Paraffin; Action of Sulphuric Acid on —. C. J. Istrati and M. Michailescu. Bull. Soc. Sciences Bucarest, 1904, 13, 143—145. Chem. Centr., 1904, 2, 1447—1448.

THE authors find that paraffin hydrocarbons of high melting point can be treated with hot sulphuric acid without carbonisation taking place. No sulphonic acids are produced by the reaction. The constitution of the higher members of the paraffin series is discussed, and it is concluded from the results of the present and of previous work that the sulphuric acid has an oxidising action, resulting in the formation of aldehydes and of cyclic compounds.

—A. S.

Paraffin Wax; Admixture of — with Substances of Higher Melting Point. [Candle Making.] E. Graefe. Chem.-Zeit., 1904, 28, 1144—1149.

IN the author's opinion the only reliable methods of determining the melting points of mixtures of paraffin wax with substances of higher melting point, are those based upon measuring the latent heat of melting at the moment of solidification, as in the methods of Finkener, of Dalican, and of Shukoff (this J., 1899, 406). In the experiments described, parallel determinations were made by Shukoff's method, by the capillary tube method, and by a method in which was determined the temperature at which solid

material adhering to the bulb of the thermometer melted sufficiently to fall off. Experiments were made with soft paraffin, melting at 42° C. (Shukoff), 42.4° C. (capillary tube) and 42.5° C. (thermometer), mixed with stearine (m.p. 55.2° C.), retene, naphthalene, montan wax (this J., 1901, 1221), acidyl derivatives of aromatic bases, such as the compound, $C_6H_5.NHCOOC_{17}H_{35}$, and with hard paraffin wax.

The author explains the well-known fact that the melting point of soft paraffin is really raised by the addition of hard paraffin by Ostwald's theory of solid solution. According to this, solid solutions consist of mixtures of isomorphous crystals or of mixtures of crystalline substances that crystallise in different forms, but yet form homogeneous mixed crystals of the shape of the predominant constituent, e.g., naphthalene and naphthol, or salicylic and benzoic acids. In the case of hard and soft paraffin it is uncertain whether there is isomorphism or formation of mixed crystals, but it is one or the other, since it is possible to isolate different components from the homogeneous mixed crystals, and in the author's opinion the evidence of the microscope points to isomorphism.

This theory also explains why addition of montan wax causes a slight elevation (0.6° C.) in the melting point of the soft paraffin. During the distillation of the wax (this J., *loc. cit.*) slight decomposition occurs, with the formation of small amounts of paraffins which are able to crystallise in homogeneous mixed crystals with the soft paraffin.

The general conclusion arrived at is, that a substance of high melting point can only raise the melting point of paraffin when it is capable of forming with it a solid solution. Otherwise it can only depress the melting point, except in such cases where it crystallises out, when it leaves the melting point unaltered.

Solidity Tests.—The addition of substances such as montan wax confers on soft paraffin a degree of solidity which does not correspond with the melting point, and in the author's opinion a solidity test should also be applied to candles. He regards the test recommended by the (German) Commission on testing technical materials (1902) as the most suitable for the purpose. This consists in keeping the candles for a definite time fixed upright in a room at a definite temperature, and noting the amount of bending. Thus, candles prepared from the mixtures described above were kept for 10 minutes at 25° C. The real melting point (Shukoff's method) is not conclusive in itself, since the solidity of mixtures containing montan wax is greater than that of soft paraffin alone. The older optical methods of determining the melting point may still be of value for comparing different kinds of paraffin, but are useless as a criterion of the solidity of candles.—C. A. M.

Lignite Tar Distilleries; Use of Waste Liquors from — as Manure. F. Strube. XV., page 1228.

Nitrogenous Refuse and Waste Sulphuric Acid [from Petroleum Refining]; Utilisation of —. E. Donath. XV., page 1228.

ENGLISH PATENT.

Esparto, Straw, Wood, &c; Utilisation [Distillation] of Residual Matters containing Alkaline and Organic Substances from the Treatment of —, in the Preparation of Paper-Pulp. E. H. Strange, J. H. Garle and A. A. Longsdon. Eng. Pat. 27,738, Dec. 17, 1903.

THE alkaline liquors are concentrated in a multiple-effect evaporator, the uncondensable gases being collected. The concentrated matter is then removed to a retort and subjected to destructive distillation. The products, consisting of combustible gases, tars, oils and soluble organic substances are collected by means of condensers and purifiers. The alkaline residue in the stills is lixiviated and the soluble alkali is causticised.—J. F. B.

UNITED STATES PATENT.

Retort [for Extracting Oil from Shale]. S. L. Hague, Salt Lake City, Utah. U.S. Pat. 775,448, Nov. 22, 1904.

A HORIZONTAL cylindrical retort is set in a suitable furnace. A screw conveyor of less diameter than the retort, works in

its lower portion and pushes the shale forward. Cross partitions above and partly around the conveyor, divide the retort into a number of compartments, which are connected together by suitable inlet and outlet pipes. A hopper is provided for feeding the shale into one end of the retort.—W. H. C.

FRENCH PATENT.

Petroleum or Gasoline Soap, and Process for Making the same. L. A. Lebreton-Deshayes. Fr. Pat. 339,061, Sept. 24, 1903. XII., page 1226.

IV.—COLOURING MATTERS AND DYE-STUFFS.

Dyestuffs; Theory of —. J. Schmidlin. Comptes rend., 1904, 139, 871—878.

WITT's view that certain molecular groupings, "chromophores," were the cause of colour in colouring matters, but that these chromophores were themselves weak and needed development by association with other groupings, "auxochromes," laid the foundation of the theory of dyestuffs. The nature of these two classes of groupings, however, has never been exactly defined. The author's view, based on his researches in the rosaniline series, is that a dyestuff is characterised by a molecule containing a strongly exothermic grouping (auxochrome), which determines the formation at another point in the molecule of an endothermic group (chromophore) containing aliphatic double linkings, which allow one part of the molecule to vibrate under the motive power of luminous waves of the same period. He recalls the fact that Helmholtz, to explain absorption, formulated the hypothesis that a molecule might contain central massive fixed portions, and mobile portions which would usually tend to maintain a position of equilibrium with regard to the fixed portions and to the ether, and that when absorption occurs, the energy of the wave-motion would be transformed into internal molecular energy (heat) by a species of molecular friction between the fixed and the mobile portions. That this dualism of the molecule should be independently arrived at by purely physical and also by chemical and thermochemical considerations renders it probable that the author's exothermic and endothermic groupings correspond to the fixed and the mobile portions of the molecule as imagined by Helmholtz.—J. T. D.

Aromatic Amino- and Hydroxy-Compounds; Action of Sulphites upon —. H. T. Bucherer. J. prakt. Chem., 1904, 70, 345—364.

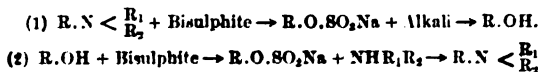
A. Technical Application of Sulphite Reactions:—(1) The reaction $R.NH_2 \rightarrow R.O.SO_2Na \rightarrow R.OH$.—Certain α -naphtholsulphonic acids are prepared, some exclusively, others most advantageously, from the corresponding α -naphthylamine compounds. These may be obtained as a rule by the sulphite reaction, the exceptions being the *o*- and *m*-sulphonic acids. The following acids may be readily prepared by it:—1.4-, 1.7-, and 1.8-monosulphonic, 1.4.6, 1.4.7-, 1.4.8-, and 1.6.8-disulphonic acids, and the 1.4.6.8-trisulphonic acid. The reaction is not available for the preparation of β -naphtholsulphonic acids. 1.8.3.6-Diaminonaphthalenedisulphonic acid being a di-m compound is not acted upon by sodium bisulphite. It is, therefore, an interesting fact that the corresponding dinitro compound is converted by the action of this salt into 1.8.3.6-aminonaphtholdisulphonic acid ("Acid H"), probably not, however, in the manner indicated in the patent specification (Ger. Pat. 113,944), namely, through the successive stages, dinitro \rightarrow diamino \rightarrow aminohydroxy, but by the direct displacement of one of the nitro groups. 1.8.5- (= 1.8.4-) Diaminonaphthalenesulphonic acid is converted by the sulphite reaction into 1.3.5-aminonaphtholsulphonic acid, the amino group in the *p*-position relatively to the sulphonic acid group, being replaced. If, however, the diamino-compound be first condensed with acetone, and the compound thus produced be submitted to the sulphite reaction, the other amino-group is attacked and 1.8.4-aminonaphtholsulphonic acid results. In the case of dihydroxynaphthalene compounds, the sul-

phite reaction is of value for the preparation of the 1.8.4- (= OH:OH:SO₃H) sulphonic acid. In the benzene series, monamines are scarcely acted upon. With some *m*-diamines which, like *m*-phenylenediamine, react easily, a mixture of products is obtained; with others, the reaction takes place with difficulty.

(2) *The Reaction R.OH → R.O.SO₂Na*.—Those sulphurous acid esters which contain free amino groups, e.g., H₂N.R''.O.SO₂Na, may be diazotised into, e.g., Cl.N₂.R''.O.SO₂Na, and the compounds of the latter type may be combined with the usual dyestuff components. By treatment with alkalis, the products are hydrolysed into hydroxyazo dyestuffs. The advantages of this method of preparing the latter are (1) the sulphurous acid esters of aromatic amino compounds well withstand the process of diazotising, their molecules being protected against the action of a slight excess of nitrous acid; (2) the azo dyestuffs formed from the esters are much more soluble than those from the corresponding aminohydroxy compounds. The soluble dyestuffs may be applied to textile fibres and be transformed, e.g., by oxidation, on the fibre, into difficultly soluble hydroxyazo-dyestuffs, faster to soaping and milling than the esters. Sulphurous acid esters with free auxochromous groups (OH, NH₂, &c.) may also be employed as dyestuff components, e.g., in preparing isomerides of dyestuffs already known and in determining the constitution of compounds in regard to which there is doubt; thus, in *Casella's* Lanacyl Blue, which is prepared by diazotising "Acid H" and combining with 1.5-aminonaphthol, the azo residue is represented as occupying the position 6. It is more likely, in the author's opinion, that the attachment is in the position 2. It would be easy to decide the point by making use of the sulphurous ester of the aminonaphthol, with which combination can take place only in the position 2.

(3) *The Reaction R.OH → R.O.SO₂Na → R.NH₂*.—In aminating 2.1-β-naphtholsulphonic acid with ammonia according to the older method, a temperature of above 200° C. is necessary, and, along with the β-naphthylamine-sulphonic acid, β-naphthylamine and β-dinaphthylamine are formed. By the sulphite method, a much lower temperature, below the temperature of decomposition of the sulphonic acid in fact, suffices for the action. The isomeric 1.2-naphtholsulphonic acid cannot be aminated by the sulphite reaction.

B. Extensions of the Sulphite Reactions.—Not only primary, but also mono- and di-alkylated amines react, according to the scheme—



R being an aromatic radicle, R₁ and R₂ alkyl groups or hydrogen atoms. The addition of mono- and di-alkylamines to hydroxy compounds by means of the sulphite reaction is, in some instances, effected with greater difficulty than is that of ammonia. Thus, in acting with methylamine upon the sulphurous ester of 1.4-naphtholsulphonic acid, it is convenient to employ a temperature of 125°–150° C., whilst with ammonia the reaction occurs at 90° C. On the other hand, the removal, by the inverse reaction, of mono- and di-alkylamines is accomplished with greater ease than is that of ammonia. The sulphite reaction may be applied to prepare alkylamines. To this end, an aromatic amine may be alkylated, decomposed by an alkali bisulphite into an alkylamine and a hydroxy compound, and the aromatic amine then regenerated by the action of ammonium sulphite upon the latter. To produce pure mono- and di-alkylamines, which in practice is always difficult, advantage may be taken of the differences in behaviour of the alkylamines, R.NH.R₁ and R.N(R₁)₂, towards sodium bisulphite at specific temperatures. A temperature can be found, for instance, at which the tertiary amine is acted upon whilst the secondary amine is unaffected, or *vice versa*. Again, a mixture of mono- and di-alkylamines, obtained by decomposing with sodium bisulphite a mixture of secondary and tertiary amines may be brought, after conversion into sulphites, into contact with an aromatic hydroxy compound at such a temperature that only one of the two reacts. The other amine, if sufficiently volatile,

may then be removed by distillation after rendering the mixture alkaline, or the alkylated amine may be precipitated, the purified aromatic alkylamine being, in either case, finally decomposed to give the pure mono- or di-alkylamine desired.—E. B.

Hydroxyazo Compounds Obtained by the Combination of Phenols with Diazo Compounds; Influence of Unsaturated Side-Chains on the Formation and Colour of — W. Borsche and F. Streiberger. Ber., 1904, 37, 4116–4136.

THE isomeric hydroxycinnamic acids and *α*-phenylhydroxycinnamic acids were investigated with regard to their behaviour towards diazo compounds. The two stereoisomeric forms of *o*-hydroxycinnamic acid, i.e. *cumaric* and *cumarinic* acids, each combine with one molecular proportion of diazobenzene fairly smoothly, to form *p*-hydroxyazo compounds. *m*-Hydroxycinnamic acid gives a poor yield of the *p*-hydroxyazo compound in alkaline solution, but the yield is very much improved if combination takes place in alcoholic acetic acid solution. *p*-Hydroxycinnamic acid does not react in alcoholic acetic acid solution. In alkaline solution a very unstable dyestuff is at once formed, which is possibly the compound—

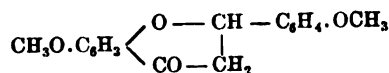


All hydroxycinnamic acids refuse to combine with two molecular proportions of diazobenzene. On the other hand, *o*- and *m*-hydroxyphenylpropionic acids were found to be capable of combining with two molecular proportions of diazobenzene, whilst *p*-hydroxyphenylpropionic acid, of course, was only capable of combining with one. *α*-Phenylcumaric acid is unknown. *α*-Phenylcumarinic acid combines with one molecular proportion of diazobenzene and *α*-phenyl-*p*-hydroxycinnamic acid behaves in the same manner, in contrast to the non-phenylated compound. On the other hand, *α*-phenyl-*m*-hydroxycinnamic acid only combines to a very slight degree, if at all, with diazobenzene. The *α*-phenylhydroxydihydrocinnamic acids behaved in all essentials in an analogous manner to the corresponding non-phenylated compounds, the β-hydroxyphenylpropionic acids. It appears that the influence of an *α*-β unsaturated side-chain on the benzene nucleus is in respect to combining power with diazo compounds, very similar to that of an azo group. Moreover, its disturbing influence is greatest when in the *m*-position to the hydroxy group, weaker in the *p*-, and weakest in the *o*-position. In order to observe the tinctorial effect of the presence of an unsaturated side-chain, the combinations with *p*-diazobenzene sulphonic acid were studied. *Cumaric* and *cumarinic* acids combined normally with this reagent, *m*-hydroxycinnamic acid only combined partially, whilst *p*-hydroxycinnamic acid yielded an unstable compound. The three hydroxyphenylpropionic acids reacted normally. It was found that the dyestuffs with unsaturated side-chain dyed wool in redder shades than the corresponding saturated compounds. Here again the influence of the unsaturated side-chain is similar to that of a second azo group. The shades produced on wool are:—Benzenesulphonic acid azocumaric acid, orange-yellow; benzenesulphonic acid azomelilotic acid, canary yellow; benzenesulphonic acid *m*-hydroxycinnamic acid, yellowish-red; benzenesulphonic acid *m*-hydroxycinnamic acid, dark yellow. Benzenesulphonic acid azo-*m*-hydroxydihydrocinnamic acid dyes in redder shades than the corresponding *o*-compound, and *α*-phenylbenzenesulphonic acid azomelilotic acid in redder shades than the corresponding non-phenylated compound.—E. F.

3.2', 3.3', and 3.4'-Dihydroxyflavonol. St. v. Kostanecki, A. v. Szlagier, A. Widmer, and K. Juppen. Ber., 1904, 37, 4155–4163.

THE authors have synthesised 3.2', 3.3', and 3.4'-dihydroxyflavonol, and find that these isomerides all dyemordanted wool fairly strongly, giving yellow shades on alumina- and brown shades on iron-mordant, showing that in this case the presence of hydroxyl groups in "anchi" position to one another is of no consequence as regards the mordant-dyeing properties of the dyestuff. The experiments on the dyeing properties of 2.2', 2.3', and 2.4-

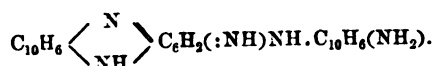
dihydroxyflavonol (Kostanecki and others, this J., 1904, 712 and 367) were therefore repeated. The authors now find that the former results were erroneous, owing to the fact that 2,2'-dihydroxyflavonol is much more soluble in hot water and in alcohol than 2,3'- and 2,4'-dihydroxyflavonol. When the latter were employed in the form of fine pastes, it was found that 2,3'-dihydroxyflavonol dyed on alumina mordant almost as strongly as the 2,2'-dihydroxyflavonol, and 2,4'-hydroxyflavonol even more strongly. The presence of hydroxyl groups in "anchi"-position is, therefore, of no importance with regard to the property of dyeing on mordants. To prepare 3,2'-dihydroxyflavonol, salicylic aldehyde methyl-ether was first treated with paeonol to form 2'-hydroxy-4'-2 methoxychalkone ($\text{CH}_3\text{O} \cdot \text{C}_6\text{H}_4 \cdot \text{CH} : \text{CH} \cdot \text{C}_6\text{H}_4 \cdot \text{OCH}_3$). This reaction is performed in presence of alcohol and sodium hydroxide. On boiling with alcohol and dilute hydrochloric acid, this is converted into 3,2'-dimethoxyflavanone—



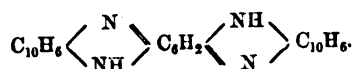
This is converted, by means of amyl nitrite and hydrochloric acid, into an isonitroso compound, which, on boiling with dilute sulphuric acid, forms 3,2'-dimethoxyflavonol. On boiling with strong hydriodic acid, this is converted into 3,2'-dihydroxyflavonol. 3,3'-Dihydroxyflavonol and 3,4'-dihydroxyflavonol are prepared in an analogous manner, the original salicylic aldehyde methyl-ether being replaced by *m*-methoxybenzaldehyde in the first case, and the 2'-hydroxy-4'-2-dimethoxychalkone by 2'-hydroxy-4'-4-dimethoxychalkone in the second.—E. F.

Fluorindines of the Naphthalene Series. R. Nietzki and A. Vollenbruck. Ber., 1904, 37, 3887—3891.

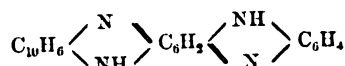
1,3,4,6-DINITRODICHLOBENZENE is condensed with *o*-naphthylenediamine in presence of sodium acetate, forming aminonaphthylidinitrochloraniline. This condenses with a further molecular proportion of *o*-naphthylenediamine, in presence of dry sodium carbonate, sodium acetate, and amyl alcohol, to form diaminonaphthylidinitro-*m*-phenylenediamine, which, on reduction with stannous chloride, tin, and hydrochloric acid, yields diaminonaphthyltetra-aminobenzene, $\text{C}_6\text{H}_2(\text{NH}_2)_2(\text{NH} \cdot \text{C}_{10}\text{H}_6\text{NH}_2)_2$, in the form of a tetrahydrochloride. This substance is oxidised by air in presence of moisture or in aqueous solution, or by ferric chloride, forming aminonaphthylidiaminonaphthophenazine,



If the oxidation is carried out whilst heating, or if the above-mentioned intermediate product is boiled with dilute hydrochloric acid, naphthofluorindene—



is formed. The hydrochloride and other salts form crystalline powders, soluble with difficulty in all solvents. The solutions are pure blue in colour. The solution of the base is red. None of the solutions are fluorescent. If the above-mentioned aminonaphthylidinitrochloraniline is condensed with *o*-phenylenediamine in presence of sodium carbonate, sodium acetate, and amyl alcohol, aminonaphthylaminophenylidinitro-*m*-phenylenediamine is formed. On reduction this yields aminonaphthylaminophenyltetra-aminobenzene, which readily oxidises to an intermediate product of an "azine" type of which the base is yellow and the hydrochloride, $\text{C}_{22}\text{H}_{17}\text{N}_8(\text{HCl})_2$, brown. On oxidising the boiling, slightly acid solution of the tetra-amino substance by means of a current of air, the mixed fluorindine—



is formed as a dihydrochloride, in crystals having a metallic lustre, and which dissolve with difficulty in alcohol to a

blue solution. On considerable dilution the colour of the solution becomes reddish, and shows weak fluorescence. The alcoholic solution of the base is brownish-yellow and shows red fluorescence.—E. F.

Iron-Cyanogen Compounds; Blue. — K. A. Hofmann, O. Heine, and F. Köchtlén. Annalen, 1904, 337, 1—36.

The authors find that Soluble Prussian Blue made from potassium ferrocyanide and less than one molecular proportion of a ferric salt is identical with Turnbull's Soluble Blue made from potassium ferricyanide and less than one molecular proportion of a ferrous salt, thus confirming the results of Skraup (Annalen, 1877, 186, 371). Both represent the ferric-potassium salt of hydroferrocyanic acid; contain water which cannot be removed without decomposition, and correspond to the formula $(\text{FeC}_7\text{O}_6 \cdot \text{K})_2 - \text{Fe}(\text{OH})_2$. Insoluble Prussian Blue, made from potassium ferrocyanide with excess of a ferric salt, or with a mixture of ferric and ferrous salts, is, if thoroughly washed in presence of air, identical with Turnbull's Insoluble Blue, made from potassium ferricyanide and excess of a ferrous salt. Precipitates obtained whilst hot, in presence of free acid, are complicated mixtures, whilst at 15° C., without excess of acid, there is always finally obtained the ferric salt of hydroferrocyanic acid, $\text{Fe}_2\text{C}_7\text{O}_6 \cdot 10\text{H}_2\text{O}$, in which the water resists all drying agents, and is therefore probably constitutional. The residue from the preparation of hydrocyanic acid is not identical with the precipitate obtained at the ordinary temperature with potassium ferrocyanide and a ferrous salt. The latter can be oxidised, according to the proportion of the constituents, to soluble or insoluble Prussian Blue, whereas the former is only incompletely oxidised by the air, but can be completely oxidised by hydrogen peroxide to Williamson's Violet, which has the same composition as Soluble Prussian Blue, but is probably a polymer of the formula—



The water cannot be removed by drying. The residue from the preparation of hydrocyanic acid is the corresponding ferrous salt—



Williamson's Blue is much more stable to dilute alkali than Prussian Blue. All the above-mentioned blue and violet compounds can be obtained by the reducing action of hydrogen peroxide on a mixture of potassium ferricyanide and a ferric salt. From this fact and their stability towards hydrogen peroxide, it is probable that they all contain the ferrocyanogen group combined with ferric iron, and not the ferricyanogen group combined with ferrous iron. Perfectly dry hydroferrocyanic acid and ferric chloride in solution in absolute alcohol, form intensely blue precipitates, similar in appearance and behaviour to those obtained in aqueous solution, but containing hydrogen, chlorine, and the constituents of alcohol, which cannot be removed by drying in vacuum over phosphorus pentoxide. They represent the hypothetical simple ferric salts of hydroferrocyanic acid, in which the extra radical ferric atoms have united with chlorine, whilst the acid cyano-hydrogen atoms thus set free have given rise to ester formation.—E. F.

ENGLISH PATENT.

Sulphur Dyes [Sulphide Dyestuffs]; Manufacture of Black. — G. W. Johnson, London. From Kalle and Co., Biebrich-on-Rhine, Germany. Eng. Pat. 26,579, Dec. 2, 1903.

SEE Fr. Pat. 347,278 of 1903; this J., 1904, 543.—T. F. B.

UNITED STATES PATENTS.

Green Dyestuff [Anthracene Dyestuff]. M. Kugel, Cologne, Germany, Assignor to Farbenfabr. of Elberfeld Co., New York. U.S. Pat. 775,367, Nov. 22, 1904.

1,4-DIAMINO-2,3-DIBROMO-ANTHRAQUINONE is heated with cupric chloride in a suitable liquid. The dyestuff forms bluish-black needles, insoluble in alcohol. It is reduced by

hydrosulphite and caustic soda, and the alkaline solution has the properties of a "vat," which dyes unmordanted cotton a blue shade, turning to a fast green on oxidation in the air.—A. B. S.

Blue Dyestuff [Anthracene Dyestuff]. M. Kugel, Cologne, Germany, Assignor to Farbenfabr. of Elberfeld Co., New York. U.S. Pat. 775,368, Nov. 22, 1904.

1-METHYLAMINO-2-BROMO-ANTHRAQUINONE is heated with cupric chloride and a suitable liquid. On reduction with hydrosulphite and caustic soda, it is converted into a hydro compound, the alkaline solution of which has the properties of a "vat," dyeing unmordanted cotton in pure blue shades.—A. B. S.

Green-blue Dyestuff [Anthracene Dyestuff]. M. Kugel, Cologne, Germany, Assignor to Farbenfabr. of Elberfeld Co., New York. U.S. Pat. 775,369, Nov. 22, 1904.

1.8-DIBROMO-2-AMINOANTHRAQUINONE is treated with cupric chloride and a suitable liquid. The dyestuff is reduced by hydrosulphite and caustic soda, the alkaline solution obtained, having the properties of a "vat" which dyes unmordanted cotton in pure greenish-blue shades.—A. B. S.

Sulphur Dye [Sulphide Dyestuff]; Dark Blue —. A. L. Laska, Assignor to K. Oehler, Offenbach-on-Maine, Germany. U.S. Pat. 775,570, Nov. 22, 1904.

SEE Eng. Pat. 12,270 of 1904; this J., 1904, 863.—T. F. B.

FRENCH PATENTS.

Quinonephenolimides and Quinonenaphtholimides; Manufacture and Separation of Stable —. Farb. vorm. Meister, Lucius und Brüning. Fr. Pat. 339,044, Sept. 17, 1903.

QUINONECHLORIMIDE, obtained by the action of bleaching powder on *p*-aminophenol in hydrochloric acid solution, is allowed to react with an equivalent quantity of phenol, *o*-cresol, *m*-cresol, or α -naphthol in presence of one molecular proportion of sodium hydroxide. From the blue liquids so obtained the phenol derivative is salted out in the form of its sodium salt, the others being precipitated in the form of their colour-acids by addition of acetic acid or sodium bicarbonate. The products are extremely stable, and may be dried without decomposition. They are easily reduced by sodium sulphide or dextrose to the corresponding dihydroxydiphenylamine derivatives.—E. F.

Sulphide Dyestuffs; Process of Making Yellow, Orange-Yellow to Orange —. Farbwerke vorm. Meister, Lucius und Brüning. Fr. Pat. 339,096, Oct. 12, 1903.

SEE Eng. Pat. 21,800 of 1903; this J., 1904, 863.—T. F. B.

Sulphide Dyestuffs; Process for Manufacturing Pure Yellow, Orange-Yellow to Yellow-Orange —. Farbwerke vorm. Meister, Lucius und Brüning. Fr. Pat. 339,103, Oct. 15, 1903.

SEE Eng. Pat. 21,945 of 1903; this J., 1904, 819.—T. F. B.

Para-acetamino-*o*-aminophenol, and Monoazo Mordant Dyestuffs derived therefrom; Process for the Production of —. L. Cassella and Co. Fr. Pat. 339,090, Oct. 9, 1903.

SEE Eng. Pat. 22,289 of 1903; this J., 1904, 898.—T. F. B.

Monoazo Dyestuffs; Process of Manufacturing Mordant —. K. Oehler. Fr. Pat. 345,128, May 31, 1904.

SEE U.S. Pat. 767,069 of 1904; this J., 1904, 863.—T. F. B.

Monoazo Dyestuffs; Process for Manufacturing Mordant —. K. Oehler. First Addition, dated June 13, 1904, to Fr. Pat. 345,128, May 31, 1904.

SEE U.S. Pat. 767,070 of 1904; this J., 1904, 863.—T. F. B.

Alizarin; Process for Manufacturing —. Badische Anilin und Soda Fabrik. Fr. Pat. 344,680, July 8, 1904. Under Internat. Conv., Feb. 22, 1904.

VERY pure alizarin, which dyes fine bluish-red shades, is produced by heating anthraquinone with very concentrated caustic alkali solution in presence of an oxidising agent. For example, 100 kilos. of anthraquinone are incorporated with a solution of 20–30 kilos. of sodium chlorate and 300 kilos. of a mixture of caustic potash and soda in 100 litres of water, and the whole heated to 200° C. in an open vessel, with agitation. The product is dissolved in water, air is blown through the solution, and the alizarin is precipitated by milk of lime. The precipitate is decomposed by hydrochloric acid, and the residue treated with dilute caustic soda solution, to separate the alizarin from the anthraquinone. The mother liquors of the process contain small quantities of benzoic acid. In place of sodium chlorate, other oxidising agents may be used, *e.g.*, sodium, barium, manganese, or lead peroxides, or mercuric oxide.—T. F. B.

Arylated 1.8-Naphthylaminesulphonic Acids; Preparation of —. Actienges. f. Anilin-fabrikation. Fr. Pat. 344,810, July 15, 1904.

1-NAPHTHYLAMINE-4.8-DISULPHONIC acid is heated to about 180–190° C. with aniline or its homologues, with or without the addition of benzoic acid or of hydrochlorides of the same bases. The sulphonic-acid group in the 4-position is thus eliminated, the amino group of the naphthylamine sulphonic acid being simultaneously arylated. After the completion of the reaction, excess of sodium carbonate is added, the excess of aromatic base driven off by a current of steam, the solution cooled and the product precipitated by addition of acid.—E. F.

Azo Dyestuffs; Process for Preparing New Intermediate Compounds and New —. G. Nath, H. Hold, and H. Ruegg. Fr. Pat. 344,844, July 16, 1904.

By sulphonating α - and β -naphthylbenzidine at a temperature of 90°–100° C., slightly soluble or easily soluble sulphonic acids are obtained, according to whether ordinary (monohydrate) or fuming sulphuric acid has been used. The sulphonic acids are suitable for the preparation of azo dyestuffs. In diazotising certain of these acids, nitroso-diazonium compounds are produced, but the corresponding nitroso-azo dyestuffs can be converted into the simple azo dyestuffs by boiling with mineral acids. Dyestuffs which give yellow shades on wool are obtained by combining the tetrazo compound of the slightly soluble β -naphthylbenzidine sulphonic acid with salicylic acid; violet, by combining with β -naphtholdisulphonic acid R; blue, by combining with aminonaphtholdisulphonic acid S. By combining the diazo derivative of the easily soluble β -acid with "R acid," a bluish-red dyestuff results. A large variety of shades is thus obtained by combining the four sulphonic acids with different phenols and amines. For instance, a black dyestuff results from combining the slightly soluble β -acid, on the one hand, with α -naphthylamine, and on the other hand, with R salt.—T. F. B.

Monoazo Mordant Dyestuff [Azo Dyestuff] Preparation of a New —. (Case I.) Kalle and Co. Fr. Pat. 345,083, July 25, 1904.

1-CHLORO-4-ACETYLAMINOBENZENE-6-SULPHONIC acid is nitrated with an equimolecular quantity of a nitrating agent. The product is either 1-chloro-4-acetyl-amino-3-nitrobenzene-6-sulphonic acid, or 1-chloro-4-acetyl-amino-5-nitrobenzene-6-sulphonic acid, or a mixture of the two. It is heated in a brine-bath with dilute sodium hydroxide solution, by which means the acetyl-amino group is replaced by a hydroxyl group. On subsequent reduction of the sodium salt of the resulting acid, by means of sodium polysulphide by preference, it is converted into a chloroamino-phenolsulphonic acid. This is diazotised and combined with one molecular proportion of β -naphthol. The resulting dyestuff yields brownish-orange shades on wool from an acid bath. On subsequent chroming, these change to bluish-black, which are said to be absolutely fast to washing and fulling.—E. F.

Disazomordant Dyestuff [*Azo Dyestuff*]; Preparation of — (Case II.) Kalle and Co. Fr. Pat. 345,084, July 25, 1904.

CHLOROBENZENE is transformed by sulphonating agents into *p*-chlorobenzenesulphonic acid. This is nitrated, and the mononitro derivative heated for several hours with dilute sodium hydroxide solution to 125°–130° C. By this means the chlorine atom is replaced by a hydroxyl group. The nitro-*p*-phenolsulphonic acid is reduced without isolation, by means of zinc dust, to the corresponding amino derivative. This is precipitated by hydrochloric acid, nitrated and again reduced by means of zinc dust. A diamino-*p*-phenolsulphonic acid is thus obtained, which is tetrazotised and combined with two molecular proportions of β -naphthol. The product dyes wool directly in violet-black shades, which, on development on the fibre by chromium salts, change to bluish-black shades, which are extremely fast.—E. F.

Monazo Mordant Dyestuffs [*Azo Dyestuffs*]; Preparation of — from α -Naphthol-*o*-Sulphonic Acid (Case III.) Kalle and Co. Fr. Pat. 345,085, July 25, 1904.

α -NAPHTHOL-*o*-sulphonic acid is combined with diazo compounds formed from derivatives of *o*-aminophenol. The resulting dyestuffs, when dyed on wool and subsequently chromed on the fibre, give reddish-black to greenish-black shades, which are said to be absolutely fast to washing and fulling. With diazotised *p*-chloro-*o*-aminophenol the resulting chromed dyeing is greenish-black; with the corresponding nitroaminophenol, reddish-black; with picraminic acid, brownish-black; and with *o*-nitro-*o*-aminophenol-*p*-sulphonic acid, violet black.—E. F.

Molasses, Vinasses, Saccharine Juices, and other Vegetable Extracts; Production of Colouring Matter from — O. Wichardt. Fr. Pat. 345,440, Aug. 9, 1904.

MOLASSES, &c. are introduced into solutions of metallic salts containing an excess of acid. In the majority of cases a colouring matter is precipitated in the cold, but especially on heating. In the case of salts of molybdenum and sulphuric acid, a colouring matter resembling indigo is said to be obtained.—J. F. B.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

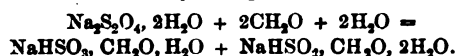
Dyeing on Mordants. M. Prud'homme. Rev. Gen. Mat. Col., 1904, 8, 365–367.

THE following general rule can be deduced from the observations of Moehlaue and Steimmig, Kostanecki and Liebermann (this J., 1901, 710), on mordant dyestuffs:—When an aromatic compound contains a hydroxy group in a position adjacent to the chromophore, or to a salt-forming group (OH, COOH, SO₃H, &c.) in the *o*-position to the chromophore, this compound will be a mordant dyestuff. By comparing and contrasting the three classes of anthraquinone dyestuffs, as defined by Buntrock (this J., 1901, 983), viz., those which only dye mordanted fabrics (*o*-dihydroxy compounds), those which dye unmordanted animal fibres (amino derivatives), and those which dye mordanted vegetable fibres and unmordanted or mordanted animal fibres (aminohydroxy derivatives), and also the various types of mordant azo dyestuffs, the conclusion is arrived at, that, when a dyestuff dyes unmordanted wool by reason of its containing a certain basic or acid group, it will also dye mordanted wool, if it contain a hydroxy group or an imino-sulphonic group (e.g., —NH.C₆H₄.SO₃H) in the position farthest from (i.e., para to) the basic or acid group.—T. F. B.

Formaldehyde-Hydrosulphite of Sodium. L. Baumann, G. Thesmar, and J. Frossard. Rev. Gen. Mat. Col., 1904, 8, 353–357.

A SOLUTION of formaldehyde-hydrosulphite of sodium, obtained by dissolving sodium hydrosulphite in 40 per cent. formaldehyde, furnishes, on cooling, an abundant crop of

well-defined crystals, which are found to consist, not of formaldehyde-sodium hydrosulphite, but of a mixture or compound of formaldehyde-sodium bisulphite, NaHSO₃ + CH₂O + H₂O, and formaldehyde-sodium bihydrosulphite, NaHSO₃ + CH₂O + 2H₂O; these two compounds were isolated by fractional precipitation from aqueous solution by alcohol, in which the bihydrosulphite compound is more soluble. This latter compound is not hygroscopic, is easily soluble in water, melts sharply at 63°–64° C., gives off its water of crystallisation at 120° C., and decomposes at 125° C. with evolution of formaldehyde and hydrogen sulphide. It is very easily decomposed in the cold by acids, but not so easily by alkalis as is the corresponding bisulphite compound. It is suggested that these bihydrosulphite-formaldehyde compounds should be used for reducing nitro to amino compounds. The above results would show that Berntsen's formula for hydrosulphurous acid (H₂S₂O₄) is incorrect, and that Schützenberger's original one (H₂SO₃) represents its constitution, the crude "hydrosulphite" being in reality a mixture of bisulphite and bihydrosulphite, NaHSO₃ + NaHSO₃ + H₂O, or Na₂S₂O₄. 2H₂O. The formation of the formaldehyde compound is hence shown by the equation—



(See also this J., 1904, 657 and 658.)—T. F. B.

Calcium Soaps; Dissolving — by Means of Ammonium Citrate. Justin-Mueller. Chem.-Zeit., 1904, 28, 1149.

THE calcium carbonate precipitated from a water of about 24° of hardness can be dissolved by a solution containing 0.5 gm. of crystalline ammonium citrate per litre, whilst the calcium soap precipitated from the same water requires nearly 100 grms. of the same salt per litre for solution. The industrial application of ammonium citrate solution for dissolving calcium soaps is thus hardly possible, but there are many possible applications of this mode of solution of precipitated calcium carbonate, e.g., in dyeing or printing with diamine dyestuffs. For this purpose the calcium should be precipitated from the water by means of an alkali, of which an excess is avoided, and the precipitate redissolved as described above.—C. A. M.

ENGLISH PATENTS.

Drying, Bleaching, Carbonising, &c. of Textile Piece Goods, by Means of Air or other Gases or Vapours; Apparatus for — J. D. Tomlinson, Rochdale. From H. and F. Haas, Lennep, Germany. Eng. Pat. 24,666, Nov. 13, 1903.

THE apparatus described in Eng. Pat. 15,108 of 1903 (this J., 1904, 659) is modified for use as a continuous machine for piece goods, by the addition of guide rollers.—A. B. S.

Calico Printing; Machine for — W. E. Wood, Accrington, J. C. Secombe. Lang Bridge, Ltd., Accrington. Eng. Pat. 25,891, Nov. 27, 1903.

FOR intermittent printing machines, in which one or more of the printing rollers have to be removed out of contact with the fabric for a definite length of time, the rollers are mounted in sliding bearings, and are pressed against the fabric by means of springs. Rams worked by hydraulic or pneumatic pressure are fitted at each side of the machine, and, when the pressure is on, they come into contact with the shaft of the printing roller and remove it out of contact with the cloth. When the pressure is released, the spring bearings force the rollers back into their printing position. The admission and release of the pressure to the rams is controlled by an arrangement of chain-gearing, which opens and closes the air- or water-valves at the arranged times. The times of contact can be altered by means of interchangeable chain wheels.—A. B. S.

Figured Fabrics; Manufacture of — J. Morton, Carlisle. Eng. Pat. 51, Jan. 1, 1904.

THE fabrics are woven with two different materials, such as wool and cotton, they are then dyed by a process which only

dyes one of the fibres, and the other fibres are either left white, or are dyed, or printed with a colour which does not affect the portions already dyed.—A. B. S.

Yarn Printing in Several Colours; Machine for —. A. Hofmann, Gothenburg, Sweden. Eng. Pat. 21,793, Oct. 10, 1904.

THE yarn-holder is fixed on a travelling carriage, which runs over the tanks containing the different colours to be printed. Each of these tanks is fitted with a printing roller, fixed on an oscillating lever, which can be brought into the position for printing by means of a Jacquard or like mechanism.—A. B. S.

Starching [Sizing] Compositions. E. M. Sharp, Padiham. Eng. Pat. 7560, March 30, 1904.

ORDINARY starch is combined with gum tragacanth, together with a small proportion of caustic soda, and the mixture is used for textile goods.—J. F. B.

UNITED STATES PATENTS.

Retting Vegetable Fibres; Apparatus for —. B. S. Summers, Chicago, Ill. U.S. Pat. 774,856, Nov. 15, 1904.

A NUMBER of digesters are connected by means of upper and lower pipes, with a chamber heated by a heating liquid, the upper pipes being situated below the level of the liquid in the heater. An additional chamber placed above the heater, and not in the circulating system, serves as replenisher, and is connected by piping with the heater and digesters. The digesting liquid is mixed with a precipitant, in an agitating chamber provided with a screw-conveyor and baffle-plates, and then passes through a filter to the heater.

—L. F. G.

Dyeing, &c.; Apparatus for —. A. Fankhauser and A. Ryser, Baden, and F. J. B. Knibiehler, Lörrach, Assignors to Wegmann and Co., Baden, Switzerland. U.S. Pat. 775,621, Nov. 22, 1904.

SEE Fr. Pat. 335,696 of 1903; this J., 1904, 251.—T. F. B.

Dyeing; Apparatus for —. J. Kershaw, Bradford. U.S. Pat. 776,069, Nov. 29, 1904.

SEE Eng. Pat. 25,108 of 1902; this J., 1903, 1345.—T. F. B.

Dyeing Machine. J. Hussong, Camden, N.J. U.S. Pat. 776,327, Nov. 29, 1904.

SEE Eng. Pat. 15,207 of 1903; this J., 1903, 1080.—T. F. B.

Centrifugal Machine [for Treating Textiles]. B. Cohnen, Grevenbroich, Germany. U.S. Pat. 776,295, Nov. 29, 1904.

SEE Eng. Pat. 7716 of 1902; this J., 1902, 1453.—T. F. B.

FRENCH PATENTS.

Artificial Silk; Manufacture of Non inflammable and Non-explosive —. R. Valette. Fr. Pat. 344,660, July 8, 1904.

As solvents for the nitrocellulose, mixtures of acetone and ethyl alcohol or of acetone and methyl alcohol are used, sometimes with addition of glacial acetic acid. The collodion is denitrated by means of ammonium nitrite.

—A. B. S.

Artificial Silk. H. D. Turgard. Fr. Pat. 344,845, July 16, 1904.

100 GRMS. of nitrated cotton are dissolved in a mixture of 2400 c.c. of 90 per cent. alcohol, 600 c.c. of glacial acetic acid, 3 grms. of albumin, and 7.5 grms. of castor oil. After well mixing, the solution is filtered and then forced through the "spinning" openings into a 1 per cent. solution of alum. The silk threads thus prepared have no tendency to stick together. The thread is finally denitrated.

—A. B. S.

Artificial Silk; Twisting and Spinning Apparatus for —. Soc. Franc. de la Viscose. Fr. Pat. 345,274, July 30, 1904.

THE cellulose solution [viscose] is fed, under pressure, through a regulating valve into the filtration chamber contained in the bracket supporting the twisting and spinning element. This latter consists of a vertical tube, rotated by a flexible connection at the top end, and supported on two sets of ball bearings carried by the tubular bracket. The viscose flowing from the filtration chamber enters the rotating tube about the middle, and descends to the spinning jet. Right- and left-handed helices are provided on the outside of the rotating hollow spindle, above and below the point where the viscose enters, to prevent any substance, either lubricant or viscose, settling between the spindle and its support. The threads are formed and twisted as they leave the rotating orifices of the jet; the latter is surrounded by a funnel-shaped appendage, which imparts a whirling motion to the coagulating liquid.

—J. F. B.

Artificial Silk; Regulating Valve for Solutions for Spinning —. Soc. Franc. de la Viscose. Fr. Pat. 345,293, Aug. 1, 1904.

AN extremely delicate valve for regulating the speed of the supply of viscose passing to the spinning tubes consists essentially of a plug-cock attached to the viscose mains, and provided with a pointer and index dial. The viscose enters the hollow plug of the cock from below, and passes out through a hole bored perpendicularly to the axis of the plug. This hole communicates with the pipe supplying the spinning jet by way of a tube passing through the plug-seating at right angles to the axis. The hole in the plug does not engage that in the seating directly, but communicates with it through a gradually shallowed groove cut in the periphery of the plug, by which arrangement the delicacy of the adjustment is enormously increased.

—J. F. B.

Artificial Silk; Continuous and Automatic Apparatus for Spinning —. Soc. Franc. de la Viscose. Fr. Pat. 345,320, Aug. 2, 1904.

THE viscose is fed by way of the regulating valve, twisting element and spinning jet (see preceding abstracts) into the coagulating bath, where it is formed into a twisted compound thread. After the thread leaves the coagulating and washing baths, it is freed from adherent moisture by a rubber wiper, and passes upwards through a guide-hole, operated with a reciprocal motion by a cam-mechanism. This distributes the thread uniformly on to one of a pair of winders, and at a given interval the mechanism of the cam transfers the thread to the other winder; the full one is then removed and replaced by an empty winder.—J. F. B.

Viscose; Jet for Spinning Threads from —. Soc. Franc. de la Viscose. Fr. Pat. 345,343, Aug. 3, 1904.

THE spinning jet consists of a metallic tube, into the mouth of which is fitted a removable disc or truncated cone, the sides of which are grooved parallel to the axis by very fine channels. When the disc is in position these grooves constitute capillary orifices through which the viscose, previously strained, is forced. When any of the orifices become clogged, the disc or cone is removed and the grooves are easily cleaned out.—J. F. B.

Mordanting and Weighting of Textile Fibres with Zinc Chloride. C. E. Carstanjen. Fr. Pat. 344,782, July 12, 1904.

To increase the fixation of oxide of zinc on the fibre, sulphates, sulphites or thiosulphates of the alkalis, of the alkaline earths or of aluminium are added to the baths of zinc chloride.—A. B. S.

Dyeing Textile Substances in Bobbins; Process for —. T. de Naeyer. Fr. Pat. 344,752, July 11, 1904. Under Internat. Conv., Nov. 26, 1903.

THE thread is wound in bobbin form on tubes in the usual manner, and then, before dyeing, is slid on to a tube of

smaller diameter than the original one, in order to reduce the tension on the inner threads, thus increasing the uniformity of the subsequent dyeings. The lengths of the tubes to which the bobbins are transferred is equal to, or slightly less than the extreme width of the bobbin, thus ensuring the bobbins being close to one another in the dye vat or other apparatus. Several bobbins, on the tubes as described above, may be held on the same core during dyeing, being kept in position by means of plates screwed on the ends of the core.—T. F. B.

Discharges on Dyed Fabrics; Process for Producing Coloured —. *Bayerische Anilin und Soda Fabrik.* Fr. Pat. 344,681, July 8, 1904. Under Internat. Conv., June 16, 1904.

ALTHOUGH good white discharges are obtained by printing dyed fabrics with formaldehyde-hydrosulphite compounds, coloured discharges produced thus, are not satisfactory, since the discharge colours are imperfectly fixed. By the addition of some aromatic amino-compound to the printing mixture, fine and perfect colour discharges of considerable fastness are produced. For example, 160 grms. of tannin, 60 c.c. of water, 185 c.c. of "dilute" alcohol, and 125 c.c. of aniline are added to 1 litre of the discharge paste, containing 2 kilos. of formaldehyde-hydrosulphite compound dissolved in gum solution. A solution of 40 or 50 grms. of a basic dyestuff of the desired colour in the minimum quantity of gum water is added, and the dyed fabric is printed with the mixture, steamed, and oxidised.—T. F. B.

Lustre; Conferring — on Materials of all kinds. H. Hall. Fr. Pat. 344,658, July 7, 1904.

THE material is passed between rollers the axes of which are oblique to one another (see figure). When the rollers



revolve, this arrangement causes a lateral pressure, which increases with the angle between the axes of the rollers.

—A. B. S.

Benzene used for "Dry-Cleaning" Fabrics; Process and Apparatus for Recovering —. E. Delhotel. Fr. Pat. 344,848, July 16, 1904.

THE fabrics saturated with benzene are suspended in a closed chamber or vat, at the bottom of which is a steam coil. Air is introduced through a pipe at the bottom of one side of the vat, and, being heated by the steam coil, removes the benzene from the fabrics. It is then pumped off up a tall column, down which a shower of cold water falls, thus condensing the benzene vapours. The mixture of water and benzene is separated in any convenient apparatus, and the benzene is removed. The cooled dry air is pumped again into the vat containing the fabrics, thus completing a closed circuit and avoiding loss of benzene.

—T. F. B.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

UNITED STATES PATENT.

Hides; Machine for Applying Colouring-Matter to —. B. W. Churchill, West Peabody, Mass. U.S. Pat. 774,935, Nov. 15, 1904.

A MOVABLE perforated cylinder surrounds a stationary cylinder-sector, the skin to be treated, being flattened and held tightly against the cylinder by exhausting the air from the latter. A rotating and "axially-reciprocating" rubber, for applying colour, is arranged adjacent to the cylinder, and opposite to the cylinder-sector, so as to apply colour to the skin at a point where it is held against the cylinder.

—B. N.

VII.—ACIDS, ALKALIS, AND SALTS.

Chamber Process; Theory of the —. G. Lunge. Z. angew. Chem., 1904, 17, 1659—1663. (See also page 1178.)

RASCHIG gives three equations as representing the changes successively occurring in the chamber, and bases the whole process upon the behaviour of a hypothetical substance which has never been actually observed as present, while neglecting altogether another substance known to be always present in large quantity (this J., 1904, 934). He makes no reference to nitrosylsulphuric acid, $\text{NO}_2\text{SO}_2\text{OH}$, nor to nitrogen peroxide. Were his theory correct, both of these substances would not merely be accessory by-products, but would exercise a harmful influence from the amount of nitrogen they would abstract from the process, and a chamber would be working so much the better the less nitrogen peroxide it showed and the less "nitrous" the cloud of sulphuric acid was. This is contrary to all experience, which shows that both nitrogen peroxide and nitrosylsulphuric acid are present in large amount in a chamber in good work, and that the latter is formed wherever sulphur dioxide and water in presence of excess of oxygen react on nitric oxide, nitrogen peroxide, or mixtures of the two. Trautz in his paper (this J., 1904, 440) on the physical chemistry of the chamber process, deals chiefly with the reactions of nitrosylsulphuric acid, and though he also treats of Raschig's equations, and admits that nitrososulphonic acid may possibly occur, he has, in the author's view, not laid sufficient stress on the divergence of Raschig's experiments from the actual conditions in the chamber. Raschig has, in fact, in studying the reaction of sulphurous upon nitrous acid, left out of consideration the influence of the enormous excess of atmospheric oxygen, which must at once convert his nitrososulphonic acid, even if it have a momentary existence, into nitrosylsulphuric acid. The existence of nitrososulphonic acid in extremely dilute aqueous solution in a beaker affords no proof of its existence in the chamber cloud, in presence of excess of oxygen. His first equation, then, does not represent a reaction really occurring in the chamber. Regarding his second, he himself admits its uncertainty. The third is as inaccurate as the first: nitrogen dioxide, in presence of water and of oxygen in excess, is quickly and completely converted into nitric acid. Only when sulphuric acid of fair concentration is substituted for water, does this oxidation not proceed to nitric acid, but then the result is nitrosylsulphuric acid, equally far removed from the result in Raschig's equation.—J. T. D.

Chamber Process; Theory of the —. F. Raschig. Z. angew. Chem. 1904, 17, 1777—1785. (See preceding abstract; and page 1178.)

THE author does admit Lunge's statement (see preceding abstract) that the presence of nitrosylsulphuric acid in the chamber is proved, and considers that the nitrous character of the chamber acid (never higher than 0.03 per cent. of N_2O_3) is due to simple solution of nitrogen trioxide in the acid, which absorbs it in its fall through the nitrous atmosphere. Even admitting, however, the existence of nitrosylsulphuric acid, its occurrence in quantity sufficient to account for its playing any important part in the working of the chamber would still be matter for grave doubt. While the author admits the necessity for an excess of nitrous gases in order that the reaction may be carried to an end, he looks on the nitrous character of the chamber acid not as the index of an unimportant by-reaction, but as a necessary evil. That this evil is only necessary for the completion of the reaction, however, is demonstrated in the fact that the earlier chambers of a set will work with excess of sulphurous acid, where there is absolutely no evidence of the production of nitrosylsulphuric acid, and where indeed there is always evidence of the production of ammonia—a circumstance only explicable on the author's theory. If Lunge postulates in such a chamber the existence of nitrosylsulphuric acid as an intermediate product, the author has much stronger grounds for assuming similarly the existence of nitrososulphonic acid. Moreover, the conditions in the chamber are arranged to secure, for technical

ends, the greatest possible speed of reaction; hence, if we are to look for any of the intermediate products in the chain of successive rapid reactions, the ultimate result of which is the same as that of the slow reaction $\text{SO}_2 + \text{O} + \text{H}_2\text{O} = \text{H}_2\text{SO}_4$, we must modify the conditions so as to retard these reactions, and thus secure for the intermediate products an existence long enough to enable us to identify them. That is why the author has modified the conditions so as to have his "chamber in a beaker," and that is why he doubts, from the very fact of its continued existence under chamber conditions (if that existence be admitted), whether nitrosyl-sulphuric acid is really an intermediate product in the process, and not rather the final product of a by-reaction. The author, then, holds to his first equation, $\text{ON} \cdot \text{OH} + \text{SO}_2 = \text{ON} \cdot \text{SO}_2\text{H}$: it is a reaction that has been shown to occur, and its occurrence under the chamber conditions may be looked on as certain, though the product so rapidly undergoes change that it may not be detected in the chamber. At least the assumption of this reaction does not, like the assumption of Lange's reaction, $\text{N}_2\text{O}_3 + \text{H}_2\text{O} + \text{O}_2 + 2\text{SO}_2 = 2(\text{NO}_2 \cdot \text{SO}_2\text{H})$ ascribe to sulphurous acid and nitrous acid, in company, the property which neither separately possesses, of rapidly absorbing oxygen. As to the author's second equation, $\text{ON} \cdot \text{SO}_2\text{H} + \text{ON} \cdot \text{OH} = 2\text{NO} + \text{HO} \cdot \text{SO}_2\text{H}$, the uncertainty expressed by him and seized on by Lange was not uncertainty as to whether anything of the kind could or did take place, but merely as to whether the equation $\text{ON} \cdot \text{SO}_2\text{H} + 6\text{ON} \cdot \text{OH} = 6\text{NO} + \text{H}_2\text{SO}_4 + \text{HNO}_3 + \text{H}_2\text{O}$, involving the formation of pernitric acid, might not really represent the reaction occurring. Either reaction involves the reduction of nitrous acid with formation of nitric oxide. The author's third reaction is traversed by Lange, who maintains that nitric oxide with excess of oxygen forms, not nitrogen trioxide or nitrous acid, but nitrogen peroxide. Though that may be the case with excess of pure oxygen, the author's direct experiments show that with air, even in quantity containing four times or even eight times the quantity of oxygen needed to form nitrogen trioxide, the oxidation of nitric oxide goes no farther than nitrogen trioxide. Only after long standing in contact with the excess of air does the nitrogen trioxide (itself formed almost instantaneously) oxidise farther to peroxide. And further experiments in which mixtures of nitric oxide and air were shaken up with water showed that, though nitric acid was indeed formed when excess of oxygen was present, no excess was sufficient to form more than one molecule of nitric acid to each molecule of nitrous acid, so that the direct oxidation never goes farther than to form nitrogen peroxide, which with water forms nitric and nitrous acids in equimolecular proportions. The author's third equation, then, $2\text{NO} + \text{O} + \text{H}_2\text{O} = 2(\text{ON} \cdot \text{OH})$, must also stand as experimental fact.—J. T. D.

Sulphates; Complex Nature of dissolved — A. Colson. *Comptes rend.*, 1904, 139, 857—859.

By comparing the depression of freezing point due to the dissolved sulphate of a divalent metal with that due to the sulphuric acid formed from it by removal of the metal, the author finds that the molecule of the dissolved salt is double that of the solid salt, and ascribes to it the formula $\text{HSO}_4 \cdot \text{M.O.M.SO}_4\text{H}$. This formula affords a possible explanation of the acid reaction of sulphates in solution.

—J. T. D.

Calcium Sulphate; Solubility of — in Solutions of Nitrates. A. Seidell and J. G. Smith. *J. of Phys. Chem.*, 1904, 8, 493—499, *Chem. Centr.*, 1904, 2, 1530—1531.

THE solubility of calcium sulphate in solutions of sodium, potassium, magnesium, and calcium nitrates at 25° C. was investigated. In all cases the solubility of calcium sulphate in solutions of the nitrates was greater than in those of the corresponding chlorides (this J., 1902, 257, 549). Calcium nitrate diminishes the solubility of the sulphate. In sodium nitrate solution, the solubility of calcium sulphate rises to a maximum and then diminishes. In concentrated solutions of potassium nitrate, the amount of calcium dissolved is greater than that corresponding to the dissolved sulphuric acid, owing to the formation and separation of syngenite, $\text{CaK}_2(\text{SO}_4)_2 \cdot \text{H}_2\text{O}$ (See also this J., 1904, 865.)—A. S.

Double Chlorides of Iron and Alkali Metals; Conditions of Formation and of Solubility of — F. W. Hinrichsen and E. Sachsel. *Z. physik. Chem.*, 1904, 50, 81—99.

SOLUBILITY determinations of mixtures of sodium and ferric chlorides, and determinations of the expansion of the solutions on heating, showed that between 0° and 60° C. no formation of a double chloride takes place. Potassium chloride and ferric chloride form a double salt, $\text{FeCl}_3 \cdot 2\text{KCl} \cdot \text{H}_2\text{O}$, at 21° C. If potassium chloride is present in excess, mixed crystals of potassium and ferric chlorides separate. The transition temperature for the formation of the double salt is between 22° and 22.5° C. Caesium chloride and ferric chloride form two double salts at 21° C., the compound $\text{FeCl}_3 \cdot 3\text{CsCl} \cdot \text{H}_2\text{O}$, when excess of caesium chloride is present, and the salt, $\text{FeCl}_3 \cdot 2\text{CsCl} \cdot \text{H}_2\text{O}$, in presence of excess of ferric chloride. The authors were unable to isolate the compound, $\text{FeCl}_3 \cdot \text{CsCl} \cdot \frac{1}{2}\text{H}_2\text{O}$, described by P. T. Walden. The temperature of formation of the red double salt, $\text{FeCl}_3 \cdot 2\text{CsCl} \cdot \text{H}_2\text{O}$, is 39.5°—39.8° C. A curve-diagram is given showing the solubility of caesium chloride in water at temperatures from 0° to 40° C. The saturated solution contains at 0.3° C., 61.9 per cent.; at 10° C., 63.5; at 20° C., 64.9; at 30° C., 66.3; and at 40° C., 67.4 per cent. of caesium chloride.—A. S.

Tellurium; Action of Hydrogen Peroxide on — A. Gutbier and F. Resenschek. *Z. anorg. Chem.*, 1904, 42, 174—176.

THE authors have succeeded in preparing telluric acid from tellurium, by dissolving the metal in potassium hydroxide solution and oxidising it with hydrogen peroxide. To the red solution of potassium telluride obtained by dissolving pure tellurium in a pure 30 per cent. solution of potassium hydroxide, three times the calculated amount of a 10 per cent. solution of hydrogen peroxide was added. A vigorous reaction took place, the solution becoming colourless, and a small quantity of metallic tellurium separating. The oxidation was completed by vigorously boiling the solution for about half-an-hour, the separated tellurium was filtered off, the solution concentrated, and a large excess of concentrated nitric acid added, whereby telluric acid separated gradually in the form of a white crystalline powder.—A. S.

Sodium Vanadate Liquors; Purification of — Observations on the Industrial Separation of Metals by double Decomposition. Herrenschmidt. *Comptes rend.*, 1904, 139, 862—864.

IN purifying a liquor containing sodium vanadate and silicate, if an acid be added, there is no precipitation unless the liquor be concentrated; and if it be so, vanadic acid and silica are precipitated together. By the author's plan (this J., 1904, 1094) of adding vanadic acid, the silica alone is precipitated, and the operation can be carried out in dilute solution. The principle here illustrated, of purifying the solution of a metallic salt by precipitating the impurities by means of the oxide or other compound of the metal in question, is one of wide industrial application, and may even be useful occasionally as a laboratory method.—J. T. D.

"Flowers of Sulphur" and Sublimed Sulphur. Domergue. *J. Pharm. Chim.*, 1904, 20, 493—499.

THE form assumed by sublimed sulphur is shown to depend upon the temperature of the condensing chamber. When the process of sublimation first commences, the difference of temperature between the vapour of the sulphur and the air of the chamber is great, consequently immediate condensation takes place, and the sulphur is deposited in a spheroidal or vesicular form. As the process proceeds, and the temperature rises, condensation takes place more slowly, and crystalline particles as well as spheroidal sulphur are deposited. Ultimately with further increase of temperature the sublimed sulphur at first formed, is melted, and, on cooling, forms friable blocks or masses which are wholly crystalline in structure. Since the commercial value of sublimed sulphur depends upon the proportion of the spheroidal form it contains, which is the allotropic condition insoluble in carbon bisulphide, it is suggested that that solvent should be employed for determining the

value, and that the term "flowers of sulphur" should be reserved for the product which shows not less than 33 per cent. of the insoluble variety at the time of production, and that the value of commercial samples be based upon this standard. Thus a sample containing 30 per cent. of insoluble sulphur should be described for trade purpose as containing 90 per cent. of "flowers of sulphur." The term "sublimed sulphur" should be applied to the whole product of sublimation without regard to its physical condition.

—J. O. B.

Potassium Ferrocyanide; Influence of Anode on Electrolytic Oxidation of —. A. Brochet and J. Petit. XI. A., page 1222.

Iron Cyanogen Compounds; Blue —. K. A. Hofmann, O. Heine, and F. Höchsten. IV., page 1209.

Phosphates; Colorimetric Determination of —. O. Schreiner and B. E. Brown. XXIII., page 1240.

ENGLISH PATENTS.

Oxygen; Preparation of —. G. F. Jaubert, Paris. Eng. Pat. 26,148, Nov. 30, 1903. Under Internat. Conv., July 3, 1903.

SEE Addition, of July 3, 1903, to Fr. Pat. 325,627 of 1902; this J., 1903, 1348.—T. F. B.

Nitrogen and Oxygen from Atmospheric Air; Apparatus for the Separation of —. R. P. Pictet, Steglitz, Germany. Eng. Pat. 14,431, June 27, 1904. Under Internat. Conv., June 27, 1903.

SEE Addition, of June 27, 1903, to Fr. Pat. 322,600 of 1902; this J., 1904, 371.—T. F. B.

UNITED STATES PATENTS.

Barium Hydrate; Manufacture of —. F. Jahn, Assignor to Harrison Bros. and Co. U.S. Pat. 775,752, Nov. 22, 1904. XI. A., page 1223.

Bisulphite Liquor; Apparatus for Preparing —. P. Drewsen and J. Parent, Assignors to Drewsen-Parent Construction Co., Shawano, Wis. U.S. Pat. 774,869, Nov. 15, 1904.

An elongated closed tank with a substantially flat bottom has its liquid supply at one end, and gas supply and discharge port at the opposite end. There are agitators, each consisting of a shaft provided with blades in and across the tank, and each having a dam in the tank's bottom behind it. There are also removable pipe sections having return bends suspended in the tank, from a bar resting on its edges, and adapted to carry "temperature controlling water" through them.—E. S.

FRENCH PATENTS.

Hydrochloric Acid and Sulphuric Acid; Process for the Production and Simultaneous Separation of —. Consortium für Elektrochem. Ind. Second Addition, dated June 27, 1904, to Fr. Pat. 335,496 of Aug. 24, 1903. (See this J., 1904, 252 and 606.)

For "acide sulfurique aqueux" in the second sentence of the second paragraph of the specification of the main patent, read "acide muriatique aqueux."—E. S.

Products having great Affinity for Water [Sulphuric Anhydride, &c.]; Process for the Condensation of —. A. H. Perret. Fr. Pat. 344,964, July 19, 1904.

THE products, such as sulphuric and phosphoric anhydrides, are distilled in a retort communicating with receivers, not sealed, but surrounded by materials not readily conducting heat and into which receptacles air, cooled and dried, is passed as it issues from a chamber in which a strong solution of calcium chloride, for instance, is continuously showered down.—E. S.

Arsenious Acid; Apparatus for the Extraction of — from Ores. E. Biguet. Fr. Pat. 345,063, July 23, 1904.

THE apparatus includes a series of muffles, in which the arsenical ore is so heated as to sublime the arsenic,

which passes into a chamber to which air is admitted, arsenious anhydride being formed and deposited. Air is aspirated through the entire apparatus in such manner as to lead the vapours through a series of large condensing chambers, and then through complementary chambers of special construction. Lastly, the vapours are led up a coke tower, sprayed at the top with water. The sulphurous acid thus collected, is treated with limestone.—E. S.

Carbonic Acid; Obtaining — from Solutions of Bicarbonate. Chem. Techn. Fabr. Dr. A. R. Brand and Co. Fr. Pat. 344,744, July 9, 1904.

THE alkali bicarbonate solution, mixed, if necessary, with soap or grease, to make a lather, is fed continuously through a tubular apparatus, heated by gases from a furnace passing through a central horizontal pipe. The froth produced passes to a cooler, where it is cooled by the incoming liquid; the froth subsides, the liberated carbon dioxide being collected and the residual solution of monocarbonate used for absorbing carbon dioxide from gases of combustion.

—E. S.

Carbonic Acid; Process for the Storage and Transport of — in a Solid State and at a Low Temperature. Gebr. Heyl and Co., and A. Wultze. Fr. Pat. 344,957, July 19, 1904.

As the carbon dioxide is stored in the solid state, the recipients need not be of great resisting power. The recipient shown in Fig. 1 is provided with a double envelop-

FIG. 1.

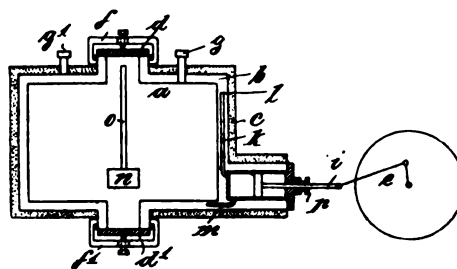
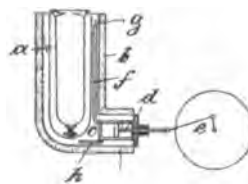


FIG. 2.



enclosing an empty space *b*, for reception of a refrigerating mixture, such as a mixture of carbon dioxide and ether; the outer layer *c* is of some non-heat-conducting material. The continual evaporation of the cooling liquid maintains the carbon dioxide within the receptacle in the solid state. *g* and *g'* are safety valves. A small apparatus for aspiration and compression is set within the space *b*, the piston to which is actuated from *e* outside the apparatus, as shown. The vapours arising from the volatile mixture are aspirated at *l*, through the tube *h*, and are compressed and liquefied by means of the tuyères *m* in the evaporating chamber, the process continuing as long as the motive force is applied. A force-pump, *o, n*, serves to remove the solid dioxide, which may be conveyed into the steel cylinder shown in Fig. 2, fitted with double envelope, &c. like that represented in Fig. 1. Such cylinders are provided with means for charging and discharging similar to those in ordinary use for storing and conveying liquid carbon dioxide.—E. S.

Ammonia; Manufacture of —. H. C. Wolterreck. Fr. Pat. 345,399, Aug. 6, 1904.

A MIXTURE of air and steam is caused to act upon peat heated in a retort at a temperature not higher than 550° C., and,

preferably, at about 400° C. Other suitable carbonaceous substances, such as coke, lignite, &c., may be substituted for peat in the process. The distilled products may contain, besides ammonia, tar, hydrocarbons, acetic acid, &c. Compare Eng. Pat. 2461 of 1902 and Fr. Pat. 332,591 of 1903; this J., 1903, 695 and 1248.—E. S.

Sulphur and Cyanides from Gas-purifying Materials [Spent Oxide]; Process and Apparatus for Extracting — J. J. M. Bécigneul. Fr. Pat. 345,071, July 23, 1904.

THE spent oxide, placed in a closed vessel, is extracted by means of "hot benzene, particularly toluene heated to 100°–110° C.;" the hot solution of sulphur is passed through a filter of animal charcoal, to remove the dissolved tarry matters, and is then cooled, to cause the precipitation of the sulphur; and after filtration the toluene is again used for extracting a fresh quantity of spent oxide. The apparatus used is connected together in such a manner as to prevent loss of solvent at any point; the extraction vessel and filters are fitted with steam jackets, so that any solvent present may be distilled off and recovered before the vessel is opened for renewing the contents. The extracted oxide is heated with lime in a closed vessel, in order to obtain the cyanide directly as ferrocyanide of calcium.—H. B.

Air and Gaseous Mixtures; Separating — into their Elements. Soc. l'Air Liquide (Soc. Anon. pour l'Etude et l'Exploit. des Procédés G. Claude et R. J. Lévy). First Addition, dated July 29, 1904, to Fr. Pat. 338,842, of June 3, 1903.

CERTAIN corrections are made to the drawing given in the main patent (see this J., 1904, 823) in reference to the overflow tube.—E. S.

VIII.—GLASS, POTTERY, ENAMELS.

Devitrification. W. Guertler. Z. anorg. Chem., 1904, 40, 268–279.

CERTAIN substances can be obtained in the form of "glasses" by rapid cooling far below the melting point, from the molten state. The time-temperature curves, plotted from the results obtained by slowly heating these glasses in the electric furnace, show a sudden upward bend, almost parallel to the temperature axis, indicating the point of devitrification, i.e., when conversion of the unstable non-crystalline vitreous form into the crystalline form occurs, with evolution of heat. This change is a non-reversible "explosive" action. The following devitrification temperatures were determined:—Sodium silicate, 550° ± 20° C.; cobalt borate, 640° ± 20°; copper borate, 675° ± 15°; manganese borate, 670° ± 20° C.—T. F. B.

Plastic Clay; Is the Shrinkage and Porosity of — in Firing, of a Mechanical or Chemical Nature? E. Berdel. Sprechsaal, 1904, 37, 1755–1757; 1792–1795.

FROM experiments made with Halle clay and Zettlitz kaolin, it appears that the felspar solidifying from the fused mass is of lower specific gravity (by nearly 0.2 per cent.) than the natural product, the change beginning first at a temperature between Seger cones 1 and 2, and decreasing up to the fusing point. The specific gravity of quartz gradually and continually diminishes on heating. The shrinkage and porosity of Zettlitz kaolin undergo modification at about the same temperature as felspar. The effect of felspar on closeness of texture can be detected at Seger cone 1, and justifies the addition of this substance, even to stoneware bodies fired at a low temperature. Its action at low heats undergoes a change coinciding with the change in specific gravity. The influence of felspar varies directly with the fineness of division, so that when very finely ground spar is added in quantity to Zettlitz kaolin the latter is rendered very close in texture, at about Seger cone 2. At low firing heats the expansion of quartz diminishes the shrinkage and close texture of the clay substance, but the action is less pronounced at the "turning point" (Seger cone — 2) already mentioned, whilst at higher temperatures the

porosity and dimensions of the ware increase. The maximum porosity is attained when quartz and clay substance are in equal proportions, and diminishes with further additions of quartz, which, however, acts less effectually in proportion as it is more finely ground. Halle clay is less influenced by heat than the earthy Zettlitz kaolin, but the influence increases as the sand is removed by levigation. A specific feature of plastic clays is the increased closeness of texture at Seger cones 09 and 1. Halle clay contains considerable quantities of silicate fluxes, which must be classed as "clay substance." The addition of quartz counteracts the influence of firing, the reverse being the case with felspar. A small amount of quartz neutralises the aforesaid decrease in porosity, small amounts of felspar having an entirely opposite effect. This behaviour indicates that the increased closeness in Halle clay is due to finely divided fluxes. The finest non-plastic particles of this clay are particularly rich in these fluxes, and when mixed with Zettlitz kaolin impart to the latter qualities similar to those of Halle clay, thus indicating the important part they play in the last named. From these particulars it is concluded that the behaviour of plastic clays on firing is in part due to the chemical action of the contained fluxes. No difference in principle, however, can be found in the action of fire on plastic and non-plastic clays.—C. S.

UNITED STATES PATENTS.

Glass; Apparatus for Manufacturing — A. R. Wilson and L. M. Dull, Assignors to A. R. Gordon, F. N. Dull, and W. E. Dittenhaber, all of Toledo, Ohio. U.S. Pat. 775,740, Nov. 22, 1904.

A RESERVOIR extends through a side wall of the tank for the glass, the reservoir being provided with an inlet communicating with the interior of the tank, and with a discharge conduit leading from its lower portion. Means connected with the exposed portion of the reservoir are provided for supplying air under pressure to the interior, so as to operate a check-valve situated within the reservoir and controlling the inlet. A heating chamber, within which is placed a burner, surrounds a portion of the reservoir. The top of this chamber constitutes a mould-receiving platform.

—A. G. L.

Granite [Glass]; Manufacture of Artificial — L. A. Garchey, Paris. U.S. Pat. 776,460, Nov. 29, 1904. See Fr. Pat. 325,475 of 1902; this J., 1903, 697.—T. F. B.

FRENCH PATENTS.

Gas Furnace for Glass Works; A Highly Regenerative Circular — C. Deselles. Fr. Pat. 344,894, July 4, 1904.

THE furnace described is for pots, and is heated by a gas-generator. A direct regeneration of the heat produced by the combustion of the gas and air in the arch of the furnace is effected by introducing and circulating air, from without, through chambers or inlets arranged in the whole mass of masonry, which is heated by the process of combustion. The air inlets, and flues for the escape of the products of combustion, are arranged in the pillars forming the openings for the mouths of the pots, and in the pillars of the arches of the furnace.—W. C. H.

Gas Furnace for Glass Works; A Circular Highly Regenerative — C. Deselle. First Addition, of July 26, 1904, to Fr. Pat. 344,994, of July 4, 1904.

THIS addition to the principal patent refers, first, to the arrangement, in the central column of the pot furnace of the air- and gas-channels so that these may be coupled two and two. To allow for the contracted width of the single channel formed by the union of an air- and a gas-channel, an increasing depth is given to the channel towards the centre of the column. In order to catch glass from broken pots, one or more receptacles are arranged outside the furnace, in such a way that the glass can flow from the "siege" down a channel into the receptacle, the bottom of the channel being luted with a vertical tile, to prevent escape of gas from the furnace, which tile is pushed off, when necessary, by the weight of glass behind it. The claims also include details

of the arrangement of air- and gas-channels in the walls and arch of tank furnaces, in order to attain in them the high degree of recuperation aimed at in the pot furnaces already described.—W. C. H.

Glass; Process and Furnace for the Continuous Manufacture of Finer Kinds of —, such as Crystal, &c. S. O. Richardson, jun. Fr. Pat. 345,256, April 7, 1904.

SEE U.S. Pats. 756,409 and 766,771 of 1904; this J., 1904, 489 and 866.—T. F. B.

Glassware; Process for Making —. J. I., C. V., F. J., F. L., and P. B. Arbogast. Fr. Pat. 345,097, July 16, 1904. Under Internat. Conv., July 16, 1903.

SEE U.S. Pat. 756,558 of 1904; this J., 1904, 490.—T. F. B.

Continuous Kilns; Arrangement to obviate the Use of Stoves, hitherto employed for the Drying of Ceramic Articles about to be Burnt in —. Soc. Perrasson fils et Desfontaines. Fr. Pat. 345,318, Aug. 2, 1904.

THE heat of the products of combustion in the hotter chambers of a continuous kiln is used for drying articles which are placed in the cooler chambers ready to be burned. The hot gases are conveyed by a system of pipes from a hood, luted with sand on to the roof of a hot chamber, to down-pipes leading into a chamber filled with articles to be dried. When necessary, the heat of the gases can be reduced by the admixture of cold air, admitted to the pipes through a valve.—W. C. H.

IX.—BUILDING MATERIALS, CLAYS, MORTARS AND CEMENTS.

ENGLISH PATENTS.

Building and Decorating Materials. A. Silbiger, London. Eng. Pat. 24,618, Nov. 12, 1903.

FROM 90 to 75 per cent. of Portland, Roman, or other hydraulic cement is mixed with 10 to 25 per cent. of asbestos, kieselguhr, or vegetable fibre in a humid state, and the mixture moulded by a pressure of about 1 ton per sq. in. into slabs of the required size. A mixture of 80 per cent. of cement and 20 of asbestos, &c. has been found to give good results; but part of the cement may in some cases be replaced by lime. Wire netting, perforated zinc, &c. may be laid between two thicknesses of the material whilst still in the humid state; or a sheet or board of asbestos, cardboard, &c. may be glued to the finished slabs. The slabs may also be secured to wooden or other frames, or they may be mounted directly on the bricks, if it is desired to cover walls.—A. G. L.

Masonry or Brickwork of Furnaces, Ovens, Pipes, Retorts, and the like; Manufacture of a New Pulverulent Product for Coating and Joining —. L. E. Muller, Paris. Eng. Pat. 15,057, July 5, 1904. Under Internat. Conv., July 8, 1903.

SEE Fr. Pat. 388,914 of 1903; this J., 1904, 985.—T. F. B.

UNITED STATES PATENTS.

Non-conducting Coverings, Blocks, and Slabs; Manufacture of —. H. C. Michell, London. U.S. Pats. 774,946 and 774,947, Nov. 15, 1904.

SEE Eng. Pats. 21,386 and 21,387 of 1902; this J., 1904, 188.

Brick or Stone, Artificial; Process of Making —. L. F. Kwiatowski, New York. U.S. Pat. 775,222, Nov. 15, 1904.

THE bricks, &c. are made from lime and sand by simultaneously incorporating and powdering the whole of the unslaked lime and part of the sand in its natural moist condition, and then adding the remainder of the sand, together with sufficient water to complete the hydration of the lime. The mixture obtained is moulded and subjected to the action of steam under pressure impregnated with salts.

—A. G. L.

Building Blocks; Method of Manufacturing — from Materials including Hydraulic Cement. H. Warden, Fredericksburg, Va. U.S. Pat. 775,588, Nov. 22, 1904.

IN order to hydrate the cement in the building blocks without washing out the soluble constituents of the blocks, the latter are placed in intimate contact with (i.e., upon) a substance having the capacity of absorbing water by capillary attraction, and so that the lower portion of the substance is immersed in water of a constant depth. The portion of the substance connecting the part immersed and that in contact with the blocks is arranged so that the flow of water through it will be induced solely by capillarity, and not by gravity, whereby an excessive supply of water to the blocks is avoided.—A. G. L.

Roofing or Flooring; Flexible —. L. C. Rugen, Boundbrook, N.J., and H. Abraham, N.Y., Assignors to The Standard Paint Co., Boundbrook, N.J. U.S. Pat. 775,635, Nov. 22, 1904.

"A SUITABLE flexible fabric" is impregnated with a heated hydrocarbon mixture to produce a foundation. In the presence of heat and pressure a coloured facing, consisting of a pigment and a carrier or flux containing a resinous body and a fatty body, is then applied to the foundation in a plastic condition, so as to cause the facing and foundation to interlock.—A. G. L.

Weatherproof Covering. L. C. Rugen, Boundbrook, N.J., and H. Abraham, N.Y., Assignors to The Standard Paint Co., Boundbrook, N.J. U.S. Pat. 775,636, Nov. 22, 1904.

To a suitable foundation is applied a permanent facing containing a pitch or bitumen of a brownish colour when examined in a thin layer, and also containing a pigment adapted to become plainly visible, or to be developed by atmospheric influences; to this permanent facing is then applied a temporary facing of about the same colour as the final colour of the permanent facing, the temporary facing being adapted to be removed by exposure to the atmosphere.—A. G. L.

Brick; Refractory —. W. F. B. Berger, Assignor to The American Bauxite Co., both of Little Rock, Ark. U.S. Pat. 775,887, Nov. 22, 1904.

THE brick is made of calcined American bauxite and about 20 per cent. of fire-clay, which acts as a binder.

—A. G. L.

Compositions [Plasters] from Calcined Gypsum; Manufacture of —. L. Mack, Stuttgart, Germany. U.S. Pat. 776,076, Nov. 29, 1904.

SEE Eng. Pat. 12,584 of 1903; this J., 1903, 952.—T. F. B.

Building Material; Artificial —. A. Seigle, Lyon-Monplaisir, France. U.S. Pat. 776,430, Nov. 29, 1904.

SEE Addition, of June 4, 1903, to Fr. Pat. 323,666 of 1902; this J., 1903, 1294.—T. F. B.

Cement; Method of Making White —. E. Gogler, Podgorze, Austria. U.S. Pat. 794,840, Nov. 15, 1904.

SEE Eng. Pat. 388 of 1904; this J., 1904, 443.—T. F. B.

Cement Kiln; Rotary —. T. A. Edison, Llewellyn Park, N.J. U.S. Pat. 775,600, Nov. 22, 1904.

SEE Eng. Pat. 4735 of 1902; this J., 1903, 367.—T. F. B.

Cement; Method of Burning —. M. Williams, London. U.S. Pat. 775,693, Nov. 22, 1904.

SEE Eng. Pat. 10,853 of 1902; this J., 1903, 629.—T. F. B.

FRENCH PATENTS.

Stone, Artificial; Manufacture of a Plastic Material for Making —. R. Hensch. First Addition, of July 15, 1904, to Fr. Pat. 341,660, of Mar. 26, 1904.

500 GRMS. of powdered slag or slate are mixed with 150 grms. of magnesite and 100 grms. of pure sand; and to

the mixture 100 c.c. of 96 per cent. sulphuric acid and 140 c.c. of magnesium chloride solution at 30° B. are added, with constant stirring. The mass is then placed in moulds and allowed to harden. A more even product is obtained by mixing 600 grms. of slag or slate powder with 150 grms. of magnesite and adding 180 c.c. of magnesium chloride solution at 30° B.—A. G. L.

Imitations of Marble in Plaster and Cement; Process for the Manufacture of — R. Hülsberg. Fr. Pat. 344,912, July 18, 1904.

IMITATION marble articles made of plaster or cement, when withdrawn from the mould, are subjected for about 24 hours to the action of an alkaline solution, such as a "treble concentrated solution of ammonia" (sp. gr. 0.910), and are washed with water immersed for about 24 hours in a solution of magnesium sulphate and sodium phosphate, then dried and, if necessary, impregnated with paraffin.—W. C. H.

Works of Art [Imitation Marble] and the like; Process for Manufacturing — H. J. P. Dumas. Fr. Pat. 345,337, Aug. 3, 1904.

See Eng. Pat. 26,568 of 1903; this J., 1904, 1029.—T. F. B.

Pavements free from Dust; Process for rendering — Chem. Werke Mügeln b. Dresden, G. m. b. H. Fr. Pat. 345,667, July 23, 1904.

To prevent the formation of dust, the materials used for the construction of the pavement are moistened and impregnated with lye, preferably that obtained in the manufacture of cellulose. The materials may be moistened and impregnated before, during, or after the laying of the pavement. The resinous substances contained in the lye are said to act as an adhesive between the dust and the materials.—W. C. H.

Plaster; Method of Revivifying Old — E. Paupy. Fr. Pat. 345,544, Aug. 12, 1904.

OLD plaster, without previous grinding, is stacked up in furnaces similar to those used for burning new plaster, with the larger pieces at the bottom, and the smaller above, and burned until dehydrated. The combustible is placed either in temporary flues built up of lumps of the old plaster, or on the ground (or on bars) under a grating which supports the plaster to be burned.—W. C. H.

Sand and Cement; Setting of Mixtures of — B. Chan. Fr. Pat. 345,122, July 26, 1904.

ACCORDING to this invention, ordinary water used for the setting of mixtures of sand and cement is replaced by lime-water, which is said to react chemically with the silica of the sand and cement, and thus improve the setting of the mortar.—W. C. H.

Cement; Rotary Furnaces for the Manufacture of — F. L. Smith et Cie. Fr. Pat. 345,419, Aug. 8, 1904.

IN rotary cement kilns, in the upper part, in which the raw material introduced undergoes drying and preliminary heating by the action of the sensible heat of the products of combustion, partitions are arranged radially or otherwise, to turn over the material and increase the surface of contact between it and the products of combustion. The partitions may be corrugated, &c., to increase the surface.—W. C. H.

X.—METALLURGY.

Blast Furnace; Operation; Apparatus; Setting of — J. E. Wetherbee. Amer. Inst. Min. Engrs. Trans. 24, 1904.

A DESCRIPTION is given of some apparatuses of charging apparatus for blast furnaces, the main object of which consist in promotion of a double bell combined with a valve. The author suggests that by means of such devices the charge could be introduced more uniformly, the pressure and that by having a more turbulent motion of material

there to blow against, better results might be obtained, since the tuyère-area could be reduced, and thus the "wandering" of the blast minimised.—A. S.

Dry Air Blast; Influence of — on the Working of the Blast-Furnace. A. Lodin. Comptes rend., 1904, 139, 922—925.

THE work of Gayley (this J., 1904, 1148) is in contradiction to the views hitherto held as to the importance of the moisture in the blast; but the striking results he has obtained are probably due to the special circumstances under which he worked. The total "heat-bills" for the two cases quoted by him show a difference due to the heat of decomposition of the moisture representing 2.8 per cent. of the total heat evolved, and it is not obvious how the saving of this should effect an economy of 19.8 per cent. in the coke used. This heat, however, is absorbed in the immediate neighbourhood of the tuyères, where a very high temperature is necessary, and where the only portion of the heat available is that given out between the temperature of the burning fuel and that of the burning slag or pig; this difference is never very considerable, because the carbon is here burnt only to monoxide. Hence small subtractions or additions of heat here will have a very important influence on the coke consumption. In the Isabella furnaces, with which Gayley worked, this influence is exaggerated by the low temperature of the blast, and the rise of 100° C. in the blast-temperature resulting from the drying, is largely responsible for the improved results. Had the blast been heated to 500° C., instead of being dried, probably the same improvement would have resulted. In Europe, where the blast is heated to 700°—800° C., the effect produced by previous drying will almost certainly be much less than that obtained by Gayley.—J. T. D.

Dry Air-Blast; Employment of —, in Blast Furnaces. H. Le Chatelier, Comptes rend., 1904, 139, 925—927.

THE economy in fuel—20 per cent.—stated by Gayley (this J., 1904, 1148) to result from the removal of the moisture from the air of the blast is four times as great as the amount due to the saving of heat which, with moist air, is spent in dissociating the water vapour and reacting with it on the coke; so that if the economy be real, its cause must be other than that to which Gayley attributes it. It is to be borne in mind that the consumption of fuel varies greatly with the temperature at which the furnace is worked; and if the dry blast, for example, gives a pig containing less sulphur than the moist blast at the same temperature, it will be possible with the dry blast to work at a lower temperature than with the moist, thus saving fuel, and yet produce an equally pure pig. If this be the true cause of economy, then it does not follow that the same economy will result, as the author concludes, from the use of dry air in other operations, such as the Bessemer process. It seems highly probable that the use of dry air will produce a less sulphurous pig; for the sulphur exists chiefly in the coke, and with dry air will burn to sulphur dioxide, which will be oxidised and absorbed by the lime in the flux and will go into the slag, never reaching the spongy iron in the layers above, whilst in presence of hydrogen derived from the moisture, phenomena of reduction will be produced, and the gases will contain a certain proportion of hydrogen sulphide, which will in part at least reach and be absorbed by the spongy reduced iron. The author has found that calcium sulphide, heated to 600° C. in a stream of dry carbon monoxide, gives off no gas that will make a ring of heated silver or a solution of silver nitrate; but when the carbon monoxide is mixed with water vapour or hydrogen, both the metal and the solution are rapidly attacked.—J. T. D.

Use of Manganese Oxide as a Desulphurising Agent in the Blast-Furnace. — Wexmeyer. Stahl u. Eisen, 1904, 24, 1077—1080.

THE use of desulphurising and crucible furnaces gave results which could not be obtained in the cupola (see this J., 1904, 1148). It is shown that the use of expensive manganese as a desulphurising agent for cast iron is irrational.

—A. S.

Rusting of Iron; Stimulating and Paralysing Effects of certain Substances on the — L. Lindet, Comptes rend., 1904, 139, 859—862.

CERTAIN metals, especially copper, when placed in water kept constantly aerated, in presence of iron, accelerate greatly the process of rusting; whilst others, such as tin, lead, zinc, manganese, aluminium, and magnesium, retard it. These effects are not due to the metal, but to minute quantities of oxide or hydroxide in solution; for water which has been for some time in contact with the metal, produces the same effect as that which contains it. Ferric oxide itself exerts an accelerating influence on rusting. Prominent among those which exert a paralysing influence is arsenious oxide; in presence of this oxide, the rusting is either stopped or greatly retarded. In the latter case, ferric arsenite is formed in a colloidal state. Arsenic pentoxide and orpiment, if present to the extent of 1 per cent., also act as retarders. Most dissolved salts, in consequence of their electrolytic dissociation, greatly increase the rapidity of rusting. Organic substances vary greatly in their action; sugar, phenol and resorcinol accelerate it, whilst alcohol, methyl salicylate, &c., retard it. The tinned or galvanised cans in which denatured alcohol is delivered often rust badly; this forms an obstacle to the use of such spirit for motor cars. Denatured alcohol is almost always made from the first runnings of the distillation, and hence contains aldehyde, ethyl acetate, and traces of acetic acid. To it is added impure methyl alcohol, containing acetone and methyl acetate, together with (if it is to be used for motor cars) an equal volume of light coal-tar spirit. This last is the substance which is most active in causing rusting. The aldehyde and esters do not provoke oxidation, but they attack the zinc or the tin, and then the iron; and the metallic acetates formed then start the oxidation. Arsenic compounds suggest themselves as a remedy for this; alcohol dissolves only traces of arsenic itself, it dissolves much more considerable quantities of its oxidised compounds.

—J. T. D.

Cyanide Practice at the Maitland Properties, South Dakota. J. Gross. Amer. Inst. Mining Eng., Sept., 1904.

THE ores worked are the so-called "Potsdam silicious ores," containing pyrrhotite and iron pyrites in about equal proportions, together with arsenic, copper, and traces of antimony and tellurium; also, considerable quantities of bismuth have been found in the zinc-box precipitates. Only the oxidised ores are subjected to cyanide treatment. The ore is crushed in a solution containing 1.2—1.3 lb. of potassium cyanide and 0.8 to 1 lb. of caustic soda per ton. For every ton of ore fed to the stamp-battery, 4—5 tons of cyanide solution are used. The crushed product obtained contains about 60 per cent. of sand and 40 per cent. of slime, and is passed to the cone classifiers, consisting of two upper conical vessels, the discharges from which unite and pass into a lower conical vessel, where they meet an upward current of cyanide solution. The aim is to make a clean sand rather than a clean slime. The sand discharged from the bottom of the lower cone is leached with a solution containing 1.5—1.6 lb. of potassium cyanide and 1.0—1.2 lb. of caustic soda per ton. The slime overflowing from the cones is treated by a system of combined agitation and decantation. The extraction averaged 62.22 per cent. of the gold, and 26.1 per cent. of the silver in the first half of 1903, and 75.32 per cent. of the gold and 44.3 per cent. of the silver in the second half. These figures, though low, exceed those yielded by test extractions by from 5—10 per cent. Of the total extraction, 47.9 per cent. is obtained in the battery, 27 per cent. from the sand-leaching, and 25.1 per cent. from the slime treatment.—A. S.

Crushing in Cyanide Solution, as practised in the Black Hills, South Dakota. C. H. Fulton, Amer. Inst. Mining Eng., Sept. 1904. (See preceding abstract.)

THE most economical extraction is obtained if the ore is crushed so that most of it is between 30-mesh (0.0195 inch) and 60-mesh (0.0075 inch) size. The separation of the sand from the slime is effected in the outer sheet-iron cones of

an ordinary hydraulic classifier, from which the inner cones have been removed. The high content of lime (added during the crushing of the ore in the cyanide solution) in the pulp is a source of trouble, both by its coagulating effect on the slime, causing the latter to settle with the sand, and by giving rise to the formation of an excessive quantity of froth or foam. In charging the sand-vats, the system of "dry-filling" is adopted, the pulp being fed into the empty vat, and the solution continually drained off until the vat is full of sand. The advantages of this method are that—(1) The slime in the pulp is uniformly distributed with the sand, whereby the percolation of the solution through the charge is favoured. (2) During the filling a large quantity of solution passes through the sand, thus increasing the extraction. Two methods of slime treatment are in use. In the first the treatment is completed in the vat into which the pulp is first charged, the agitation being effected by means of compressed air. In the second method, the slime is repeatedly transferred from one vat to another (generally 3 or 4 times), and the charge is agitated by means of centrifugal pumps.—A. S.

Platinum; Volatilisation of — G. A. Hulett and H. W. Berger. J. Amer. Chem. Soc., 1904, 26, 1512—1515.

PLATINUM begins to volatilise in air at about 800° C., and the action increases markedly as the temperature rises. In a vacuum or an atmosphere free from oxygen, there is no volatilisation. The phenomenon is consequently due to the presence of oxygen, and it seems probable that there exist volatile compounds of the platinum metals which are stable at high temperatures, but decompose at lower temperatures, and such compounds would probably be endothermic. The existence of a volatile oxide of platinum which decomposes at 800° C. and below, but is stable above that temperature, would account for all the observed facts. The "sprouting" of molten platinum when cooling may be due to the decomposition of such a compound.—T. H. P.

Copper, Tin, and Oxygen. E. Heyn and O. Bauer. Mitt. k. u. k. Materialprüfungsamt, 1904, 22, 137—147.

A PREVIOUS investigation dealt with the relations between copper and oxygen (this J., 1901, 723, 956). In the present series of experiments, the authors investigated the action of oxygen or compounds containing oxygen on fused copper-tin alloys, and the changes produced thereby during and after solidification. The results have a bearing on the technical question of the alteration of bronzes when these are fused with access of air. It was found that any oxygen contained in copper-tin alloys is in the form of crystals of stannic oxide, which are insoluble in the fused alloy (and also in fused tin). The crystals are frequently stunted, forming pellicles, which are always found in that constituent of the alloy which solidifies last, i.e., that which is rich in tin. The presence of stannic oxide causes a thickening of the fused alloy. If cuprous oxide be used in preparing the alloys, this reacts with the tin at the melting temperature, forming copper and stannic oxide. Phosphorus is an effective de-oxidising agent for copper-tin alloys containing stannic oxide. If copper tin alloys be fused with access of air, there are formed at first an upper layer of an alloy of copper and cuprous oxide, and a lower layer of a copper-tin alloy, both containing crystals or pellicles of stannic oxide. If the heating be continued for a sufficiently long period, the lower layer entirely disappears, the whole of the tin being converted into stannic oxide. The authors also state that the grey and yellow patches frequently observed on a fracture of a commercial tin bronze are not due to segregation (liquation), but to the formation of large grains owing to slow cooling. The different coloured patches of metal contain the same percentage of tin, and with more rapid cooling they become smaller, and so intimately mixed, that the fracture exhibits a uniform "mixed-colour."—A. S.

Stannic Oxide in Copper-Tin Alloys; Electrolytic Separation and Determination of — E. Heyn, XXIII., page 1239.

Arsenical Poisoning; Danger of —, to Workmen engaged in Autogenous Soldering. G. Lunge. *Chem.-Zeit.*, 1904, 28, 1169—1170.

THE author has already drawn attention to the danger arising from arsenical hydrogen to workers with autogenous soldering apparatus, especially in close workshops or in the inside of small vessels. He now gives some figures communicated by Major Nathan, of the Government Powder Works at Waltham Abbey, contained in a report (not yet printed) by Mr. Robertson, the chemist there. Tested by the Marsh-Berzelius process, samples of zinc from Ash and Lacey showed from 0.00008 to 0.00015 per cent. of arsenic (0.0074 to 0.0140 grains of arsenious oxide per lb.); one marked G. v. Giesches Erben, 0.0008 per cent. (0.074 grains per lb.); one of Brunner, Mond & Co.'s electrolytic zinc 0.00008 per cent. (0.0074 grains per lb.). Hence, a maximum limit of 0.0005 per cent. of arsenic (0.047 grain of arsenious oxide per lb.) may fairly be demanded of dealers. Three samples of sulphuric acid yielded:—a, Denitrated, not concentrated, acid, 0.00022 per cent. (0.02 grain per lb.); b, Concentrated acid from the Kessler evaporator, the same amount; c, Chapman and Messel's acid, half the amount. Taking 0.0005 per cent. in the zinc, and 0.00022 per cent. in the acid, a week's work in the soldering shop at Edmondsey would produce 180 c.c. of arsine, forming 0.845 gm. of arsenic trioxide, or 0.141 gm. per day. The danger of direct poisoning by this amount of arsenic trioxide is small; but it is not to be disregarded, nor is that due to accumulations of arsenical dust. Arsine itself is, of course, much more poisonous than the product of its combustion, and the escape of the gas by faulty tubing or connections, or leaks in the apparatus, should be carefully guarded against. Copper sulphate solution, with which the author recommended that the gas should be washed to remove the arsenic, has not been found effectual by Robertson, who recommends for the purpose 5 per cent. permanganate solution, or chromic acid in sulphuric acid solution. The author suggests the use of electrolytic hydrogen, which prepared from alkaline solutions is probably free from arsenic, and could be sold, compressed in cylinders, at little more cost than that made from acid and zinc.—J. T. D.

ENGLISH PATENTS.

Iron; Manufacture of —, in the Blast Furnace. W. J. Foster, Walsall. Eng. Pat. 755, Jan. 12, 1904.

THE present invention is an enlargement of Eng. Pat. 4147, of 1901 (this J., 1902, 349), according to which highly-heated solid carbon and fluxes were injected into the furnace by and with the hot blast through the tuyères. Under the present extension, metal pieces, such as "swarf" (iron or steel turnings, or shavings), or metallic iron of any form, with or without solid carbon and fluxes, and previously heated to a temperature at least as high as that of the hot blast, are injected with the blast into the furnace, as described in the cited patent.—E. S.

Regenerative Furnaces [for Steel Manufacture]; Impts. in —. B. Talbot, Leeds. Eng. Pat. 1365, Jan. 19, 1904.

IN regenerative gas furnaces, and especially in such as are used in the manufacture of steel, in order to cool the masses of brickwork at the two ends of the furnace, through which the uptakes bring the gas and air from the regenerators into the furnace, a chamber is built into such brickwork, preferably semi-circular in cross section, having its bottom open, or partly open to the air on the side facing the furnace, whilst the top is closed, and provided with air-channels passing completely through the brickwork to allow of air circulation.—E. S.

Steel; Manufacture of —, and Treatment of Copper-Nickel, and like Mattes. Cie. du Réacteur Métallurgique, Paris. Eng. Pat. 14,985, July 4, 1904. Under Internat. Conv., Aug. 6, 1903.

SEE Fr. Pat. 334,454 of 1903; this J., 1904, 66.—T. F. B.

Zinc; Extraction and Purification of —. A. V. Cunningham; Winnington, Cheshire. Eng. Pat. 4706, Feb. 25, 1904.

THE preferably roasted, and finely-divided zinc ore, is stirred in a strong solution of zinc chloride, and the basic zinc salts formed are converted into the chloride by the addition of hydrochloric acid, introduced below the surface of the liquid. The process may be made continuous by making successive additions of ore and of acid, and withdrawing the exhausted portion of the ore. To free the liquor from arsenic, either freshly-precipitated ferric hydroxide is stirred into the neutral or slightly alkaline liquid, or, to the slightly acid liquor containing ferric iron in solution, zinc oxide, lime, or the like is added to precipitate ferric hydroxide, which carries the arsenic down with it, and the precipitate is removed. The arsenic-free liquor may be treated electrolytically or otherwise, to recover the zinc and other metals present.—E. S.

Alloy. Soc. Anon. La Néo-Métallurgie, Paris. Eng. Pat. 23,361, Nov. 3, 1903. Under Internat. Conv., Nov. 6, 1902.

SEE Fr. Pat. 326,140 of 1902; this J., 1903, 805.—T. F. B.

Alloy or Compound; Metallic —. Soc. Anon. La Néo-Métallurgie, Paris. Eng. Pat. 24,924, Nov. 16, 1903. Under Internat. Conv., April 17, 1903.

SEE Fr. Pat. 331,276 of 1903; this J., 1903, 1136.—T. F. B.

Alloys; Manufacture of —. A. Jacobsen, Hamburg, Germany. Eng. Pat. 6945, March 22, 1904.

SEE Fr. Pat. 342,054 of 1904; this J., 1904, 903.—T. F. B.

Metals and Alloys; Hardening of —. S. Cowper-Coles and Co., Ltd., and S. O. Cowper-Coles, London. Eng. Pat. 27,172, Dec. 11, 1903.

ALUMINIUM, or an alloy of aluminium, is covered with zinc dust (containing some zinc oxide) within a receptacle, which is closed, and heated to a temperature below the melting point of zinc, say to about 400° F., for a suitable period. It is stated that the articles on removal will be found to be "coated with zinc," which penetrates to a certain depth, forming a very hard skin. The process is also applicable to articles made of copper or alloys of copper.—E. S.

UNITED STATES PATENTS.

Steel; Manufacture of —. T. J. Tresidder, Sheffield. U.S. Pat. 774,958, Nov. 15, 1904.

SEE Fr. Pat. 333,582 of 1903; this J., 1903, 1353.—T. F. B.

Steel Armour Plate, &c., with a Hardened Face; Manufacture of —. T. J. Tresidder, Sheffield. U.S. Pat. 774,959, Nov. 15, 1904.

SEE Eng. Pat. 8299 of 1903; this J., 1904, 325.—T. F. B.

Steel; Treating Scrap — and Recarburising the same. H. B. Atha, East Orange, N.J. U.S. Pat. 774,973, Nov. 15, 1904.

SEE Eng. Pat. 2187 of 1904; this J., 1904, 609.—T. F. B.

Puddling Furnace; Mechanical —. W. B. Burrow, Norfolk, Va. U.S. Pat. 775,026, Nov. 15, 1904.

THE furnace is of the stationary reverberatory type, having a hearth or metal bed supported by machinery, with means for imparting to it combined rocking and horizontal movements. There is a concave lining within and around the hearth, and refractory linings project on either side over the concave lining and the bed, whereby the flames are deflected downwards upon the hearth. The inclined planes or wedge-shaped run-ways for the bed have a water-cooled track. A fireplace at each end of the furnace supplies the hearth with the products of combustion, and a pendant angular roof has its lowest point immediately above the hearth at the centre of the furnace, and from which flues pass for exit of waste gases. A stationary, detachable

toothed rabble extends into and across the hearth in the direction of its width, for stirring and raking the metal as the hearth oscillates. The furnace is specially adapted for the manufacture of wrought or malleable iron. (Compare U.S. Pat. 755,215 of 1904, this J., 1904, 444.)—E. S.

Gold and Oxide of Iron; Process of Recovering — from Sand. T. J. Lovett, Chicago. U.S. Pat. 775,043, Nov. 15, 1904.

SAND containing magnetic iron oxide with gold is mixed with water and treated magnetically, to concentrate the iron oxide with the gold which it carries, which concentrate, together with that obtained from the tailings of the first process, is subjected to the action of a suitable chemical solution "capable of dissolving the gold without material injury to the iron." The undissolved iron oxide is left in an available condition, and the gold contained in the solution is recovered.—E. S.

Gold-saving Apparatus. L. Sachse, Oroville, Cal. U.S. Pat. 774,786, Nov. 15, 1904.

THIS is a float-gold saving apparatus, in which a tank is separated by an intermediate floor into an upper and lower compartment, communicating through an opening in the floor. A trough is formed within the upper compartment into which the body of silica-carrying water flows. Wells are formed between the outer walls of the trough and of the compartment. There are adjustable means vertically over the opening in the floor, whereby the inflowing liquid is intercepted, and the precipitates from it are directed through the opening into the lower compartment, and in the path of the flow it is arranged to project water into the inflowing current of gold-carrying water, in opposition to the downward current from the feed sluice. The general arrangements are such that a body of the water carrying black sand is held for a time approximately still, an eddy being caused when desired by a suitably placed water-pipe; there are also adjustable deflectors whereby the flow is deflected as desired.—E. S.

Metals; Extracting [Cyanide Process] — from their Ores. F. H. Long, Chicago, Ill. U.S. Pat. 775,405, Nov. 22, 1904.

THE mixed ore and cyanide solution are contained in a closed vessel having a funnel-shaped bottom terminating in a pipe so connected, branched and valved, that when the mixture is caused to flow into the pipe by pressure of an air-blast, it may be caused to return to the reservoir by a branch leading to the top of the latter, or may be otherwise diverted. In any case the effect is to pass the charge "through a contracted channel" with the air-blast, so as to revivify the cyanide and "clear" the ore.—E. S.

Precious Metal from Ores; Process of Extracting — J. J. Berrigan, East Orange, N.J., Assignor to F. J. Arend, New York, and J. Bernstrom, Stockholm. U.S. Pat. 775,509, Nov. 22, 1904.

THE process is continuous, and consists in causing the comminuted ore to meet a stream of an aqueous solvent of the precious metal, whereby an a-rated mixture of ore and solution is produced. This mixture is then centrifugally agitated and projected through successive quantities of solvent contained in a number of vessels arranged at different levels and communicating with one another, the mixture descending by gravity from one vessel to the next lower one. The enriched solution is finally separated centrifugally from the ore. (See the two following abstracts.)—A. S.

Precious Metal from Ores; Apparatus for Extracting — J. J. Berrigan, East Orange, N.J., Assignor to F. J. Arend, New York, and J. Bernstrom, Stockholm. U.S. Pat. 775,414, Nov. 22, 1904.

THE comminuted ore and an aqueous solvent of the precious metal are fed into a horizontal mixing vessel through separate inlets at the top. A conveyor is arranged inside the vessel to move the ore towards the outlet, which is at

the bottom, below the inlet for the solvent. The mixed ore and solvent pass by gravity to the highest of a number of centrifugal agitators, arranged at different levels, each of which consists of a vessel rotating on an eccentric axis, and having an outlet in its circumferential wall, and means for discharging the ore and solution through the outlet. From the lowest agitator the pulp passes to a centrifugal separator, in which the enriched solution is separated from the ore. (See following abstract.)—A. S.

Centrifugal Separator. J. J. Berrigan, East Orange, N.J., Assignor to F. J. Arend, New York, and J. Bernstrom, Stockholm. U.S. Pat. 775,415, Nov. 22, 1904.

THE separator consists of a frusto-conical vessel supported eccentrically within a horizontal rotary cylinder mounted on axial trunnions, the larger end of the separator and one end of the cylinder being in one piece. One of the trunnions is hollow, and the mixture of solid and liquid materials is fed continuously through it into the large end of the separator. Inside the separator is a spiral conveyor for moving the solid material from the inlet to the outlet, the latter being at the small end of the separator. By means of suitable gearing the conveyor is rotated at a speed different from that of the separator. The liquid is discharged through an outlet in the large end of the separator between its circumferential wall and the axis of rotation, the outlet extending through the hollow trunnion.—A. S.

Metals; Apparatus for Treating Finely-divided Material for the Recovery of — D. C. Boley, Deadwood. U.S. Pat. 774,736, Nov. 15, 1904.

THE apparatus belongs to the type in which ores are treated with a solution, and are washed by upward filtration. There are two elevated supply tanks, one for the solvent liquid and one for water, and there is a compressed air or gas supply, all connected by valved pipes to the bottom of the filtering tank, so that solution, water, or compressed air may be submitted, separately or otherwise, with a float-regulator valve operating for cutting off or turning on the liquid supply. A lining of textile fabric is secured to the upper surface of a perforated (double) tank bottom, by folds of the fabric inserted as grooves, the folds being filled "with the packing material as a rope, and held to the tank bottom by battens overlying the groove, but placed beneath the textile fabric," the edges of the latter being secured to the sides of the tank.—E. S.

Ores; Process of Reducing — H. F. Brown, Oakland, Cal. U.S. Pat. 774,930, Nov. 15, 1904.

THE powdered ore is passed through highly heated vertical tubular apparatus, in which the air is not whirled, and is then continuously passed in its hot state through a whirling heated atmosphere moving in the same direction as the descending body of ore.—E. S.

Ore-roasting Furnace. A. P. O'Brien, Richmond, Va. U.S. Pat. 775,147, Nov. 15, 1904.

THE furnace is of the vertical type with a number of superposed hearths fed from above, and a central hollow vertical rotating shaft divided into as many vertical compartments as there are hearths. A hollow arm carrying rabblers extends into the shaft at each compartment, through its walls. The rabble arms have internal passages for leading air from one compartment in the shaft to the adjoining one. The disc secured to the shaft, whereby it is rotated by means of suitable gearing, is thin and somewhat flexible, that it may accommodate itself to the expansion or contraction of the shaft by changes of temperature. The blades of the rabblers are progressively set at different angles from one end of the arm to the other, whereby the action of the blades on the ore is varied. There is a gas collector at the top of the furnace, including a segmental casing in connection with a series of pipes leading to it from different parts, an elongated slot being formed in the casing for reaching every portion of the gas collector. Provision is made for the passage of water through the shaft and rabble arms.—E. S.

Zinc; Apparatus for the Extraction of — C. S. Brand, Knowle, England. U.S. Pats. 775,359 and 775,360, Nov. 22, 1904.

SEE Fr. Pats. 341,345 and 341,346 of 1904; this J., 1904, 827.—T. F. B.

Copper or like Metals; Process of Separating — from their Ores. P. Weiller, Vienna, and A. Weiller, Trieste, Austria. U.S. Pat. 775,548, Nov. 22, 1904.

SEE Addition, of April 7, 1904, to Fr. Pat. 336,989 of 1903; this J., 1904, 908.—T. F. B.

Metals; Process of Separating — from Sulphide Ores. C. V. Potter, Balaclava, Vic. U.S. Pat. 776,145, Nov. 29, 1904.

SEE Eng. Pat. 1146 of 1902; this J., 1902, 410.—T. F. B.

FRENCH PATENTS.

Steel; Process for Incorporating Crystalline or Amorphous Silicon Carbide with — W. Kaufmann and A. Bouvier. Fr. Pat. 344,906, July 13, 1904.

THE silicon carbide is introduced in equal quantities, at regular intervals, into the molten metal as it runs into the ladle or mould, the carbide being introduced at a point close to where the stream of metal enters the ladle, so as to obtain a homogeneous product. The molten metal should be as hot as possible, and should contain no slag, otherwise the carbide will be decomposed. The following proportions of carbide are used: for steel for tyres, 0.11 to 0.12 per cent.; for moulded steel, 0.37 to 0.39 per cent.; for mild basic steel (resistance, 46–50 kilos.), 0.075 to 0.08 per cent.—T. F. B.

Metals and Oxides; Means for Recovering — from Solutions containing them. A. Gutensohn. Fr. Pat. 344,630, July 6, 1904.

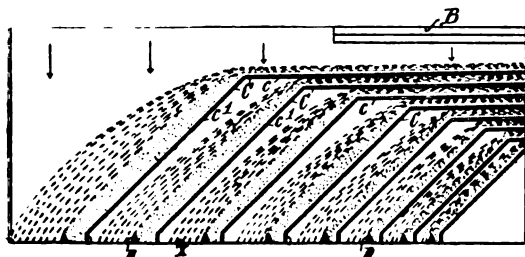
METALS, or their oxides, are recovered from their acid solutions by treatment with a precipitant prepared by heating together melted rosin and slaked lime, and then adding a solution of sodium carbonate and caustic soda. The precipitant is brought into contact with the, preferably hot, solution to be precipitated, and more alkali is subsequently added. The oxide or metal is carried down in combination with the rosin. The resulting compound is collected and distilled in order to recover the rosin, the metal being obtained as such or in the form of its oxide.—E. S.

Melting Furnace. Osnabrücker Maschinenfabrik, B. Lindemann. Fr. Pat. 344,935, July 18, 1904.

THE furnace is formed with double walls, within which is a serpentine channel for the heating of the air to be admitted to the grate.—E. S.

Ores; Concentrators for — J. F. C. Abelspies. Fr. Pat. 345,198, July 20, 1904.

THE table represented in plan in the drawing is slightly inclined, so that the mud or pulp flowing upon it from the reservoir B is received by the groove C, and overflows to the next, and so on, whilst the stream of washing water drives the ore downwards, and, aided by a see-saw motion continuously imparted to the table, forms whirls on the way. The flow is also towards the edge of the table. The portions of the grooves marked C are only slightly inclined, whilst the parts marked C¹ make a descent of about 45° to



the horizontal. At the lower edge of the table, the currents from the several grooves are kept apart by the guides D, the waste and the concentrate being directed into separate channels. The grooves are successively farther apart from the lowest to the highest part of the table.—E. S.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(A).—ELECTRO-CHEMISTRY.

Electrolysis with Alternating Current. A. Brochet and J. Petit. Z. Elektrochem., 1904, 10, 909–912.

THE solubility of platinum under the action of alternating currents is ascribed to secondary chemical reaction between the finely divided metal thrown off from the cathode and the cyanide solution. Iron is dissolved under the influence of alternating current, but shows an anomalous behaviour. Increase of current density favours the reactions up to a limit when the solubility reaches its maximum value. Although higher frequency of the current generally decreases the chemical effect, this is not always the case.

—R. S. H.

Barium Platinocyanide; Preparation of — A. Brochet and J. Petit. Z. Elektrochem., 1904, 10, 922–924.

THE authors find that the usual somewhat tedious chemical preparation of this salt can be greatly simplified by making use of the fact that platinum is soluble in barium cyanide under the influence of alternating current. With a current of 0.4 ampère per sq. cm., a P.D. of 5 volts, and an electrolyte containing 270 grms. barium cyanide per litre, they obtained a satisfactory product. About 6.0 K.W. hours are required per kilo. of the double salt. The product which is obtained by crystallisation does not at first possess the fluorescence necessary for its use for X-ray screens; but by recrystallisation from a solution containing cyanide, e.g., barium cyanide, the small fluorescent crystals are readily obtained. (See also this J., 1904, 548.)—R. S. H.

Potassium Ferrocyanide; Influence of Anode on Electrolytic Oxidation of — A. Brochet and J. Petit. Comptes rend., 1904, 139, 855–857.

IN the electrolysis of potassium ferrocyanide there may appear at the anode not only potassium ferricyanide, but also hydroferrocyanic acid, the production of the latter involving escape of free oxygen, which is thus lost as far as the production of ferricyanide is concerned. If the ferrocyanogen ions can attack the anode, the metallic ferrocyanide is formed, and if this be insoluble, it forms a resisting coating and lessens the current or raises the potential difference in the cell. The authors have employed anodes of various materials, and divide them into five groups:—1. Those not forming metallic ferrocyanide (platinum, carbon); 2. Those slightly attacked, and giving fair yields (iron, cobalt, nickel); 3. Slightly attacked, but poor yields (lead, antimonial lead, tin); 4. Strongly attacked, but variable yields (copper, zinc, cadmium, mercury); 5. Those behaving as soluble anodes (magnesium, aluminium, silver). The yields vary from 75 per cent. of the theoretical (platinum), or 50 per cent. (iron), to none; and the physical condition of the anode is important, platinised platinum only yielding 45 per cent., for instance, against 75 per cent. for the polished metal.

—J. T. D.

Transformer Oils. D. Holde. III., page 1206.

Copper; Electrolytic Determination of — A. Kufferath. XXIII., page 1239.

Stannic Oxide in Copper-Tin Alloys; Electrolytic Separation and Determination of — E. Heyn. XXIII., page 1239.

ENGLISH PATENTS.

Batteries; Electric — P. J. Kamperdyk, New York. Eng. Pat. 214, Jan. 4, 1904.

EACH cell has a central porous vessel of carbon, open at its upper and lower ends, and two similar lateral porous

vessels, one side wall of each of the latter being formed by the corresponding wall of the outer receptacle. The porous vessels may be provided internally with a supporting metallic frame of wire. The bottoms of the vessels are closed by being embedded in a layer of suitable material on the base of the outer cell, and the porous vessels thus form the positive compartments, the positive electrodes consisting of carbon rods or balls in contact with non-oxidisable metal, or conductors coated with such a metal, or the balls may be threaded on the conductors. The negative electrodes of zinc may have an internal supporting framework of non-oxidisable metal, or wire covered with such a metal. Pipes are also embedded in the material closing the bottoms of the porous vessels, so as to make connection between the positive or between the negative compartments. A number of cells are in communication with feed reservoirs in such a way that the exciting and depolarising liquids may be fed into the cells, or withdrawn through waste pipes. For this purpose there is a system of communication between the cell compartments and the reservoirs, the system comprising two conduits, which may be rotated, and each is provided with three apertures, the latter being adapted so that two of them simultaneously coincide with ducts in connecting boxes. Tubes lead from the boxes to the cell compartments. Three-way cocks are inserted in the conduits, so that in one position of the latter the liquids are delivered from the reservoirs into the cell compartments, and in the second position the liquids are withdrawn through the waste pipes.—B. N.

Accumulators or Secondary Batteries. T. Pescatore, Manchester. Eng. Pat. 1036, Jan. 15, 1904.

Two plates, A, made of hard lead, are placed back to back, the space a^1 between the ribs a being filled with a composition B, composed of a mixture of active spongy material and an inert powder, the material being held in position by means of a network of cross ribs a^2 . If necessary, a lead plate D may be placed between the plates A so as to increase the surface contact, and the plates are then bolted together. The material is maintained constantly in compression, and is prevented from expanding or swelling, thus avoiding loss of conductivity from disintegration and separation of the particles of the material.

—B. N.

Activity in Electrode Masses of Badly Conductive Metallic Oxides or Hydrates; A Method for Increasing the —, in Accumulators with Invariable Electrolyte. E. W. Jungner, Norrköping, Sweden. Eng. Pat. 21,403, Oct. 5, 1904, under Internat. Conv., Oct. 31, 1903.

THE method claimed consists in intimately mixing powdered electrode masses of badly conducting oxides or hydrates [hydroxides] with well pulverised "chemically pure black lead," and then mixing with pure crystalline graphite in the form of flakes or scales, in order to increase the conductivity of the masses.—B. N.

Cells; Galvanic —. R. Ziegenberg, Berlin. Eng. Pat. 21,913, Oct. 11, 1904.

PLATES of peroxide of lead are first dried in a moderately heated atmosphere, and finally in a suitable vacuum apparatus. While the vessel is still exhausted, concentrated sulphuric acid is admitted from below so as to cover the plates, and air is then allowed to enter from above in order to drive the acid into the pores of the peroxide. The plates,

charged with acid, are then placed in a suitable vessel with zinc plates, and water is added to form a galvanic cell.

—B. N.

UNITED STATES PATENTS.

Electrical Energy; Converting the Energy of Fuel into —. H. Jone, Chicago, Ill. U.S. Pat. 775,472, Nov. 29, 1904.

A GALVANIC cell is constructed with a positive pole of metal, a negative pole consisting of a porous carbon vessel, which contains a metallic oxide as depolariser, and an alkali as electrolyte. The cell is maintained at an elevated temperature by means of the waste heat produced at other stages of the process; and electrical energy is generated by oxidation of the metal, the depolariser being simultaneously de-oxidised. The oxidation product of the metal is then reduced to metal by introducing into the cell hot fuel gases from carbonaceous materials, or a reducing gas obtained from the fuel gases. Tin is mentioned as a suitable metal, and also those metals which generate hydrogen with alkali, which are capable of "acting as an acid towards alkali;" which form oxides that yield chiefly carbon dioxide in addition to metal when reduced by carbon, and which form lower and higher oxides. In the last-mentioned case, the oxidation is carried only to the formation of the lower oxide.—A. S.

Storage Battery Plates; Protective Coating or Covering for —. A. Meygret, Paris. U.S. Pat. 776,192 and 776,480, Nov. 29, 1904.

SEE Eng. Pat. 1673 of 1903; this J., 1904, 119. The plates may also be coated with a mixture of cellulose tetracetate and tetrabutryate, or with the latter alone.—T. F. B.

Furnace; Electric —. R. Raddatz, Milwaukee, Wis. Assignor to Allis-Chalmers Co., N.J. U.S. Pat., 775,282, Nov. 15, 1904.

A TRAVELLING bed, adapted to support and carry forward the substance to be treated, is provided with a feeding device for delivering the material to the bed, and electrodes, with their ends brought within "arcing" distance, are arranged in proximity to the point at which the material is delivered. The negative electrode is relatively nearer, and the positive electrode farther from the feeding-inlet. Suitable mechanism imparts motion to the bed and feeding devices, and means are provided for varying the relative movements of these, in order that the feed and delivery may be accurately proportioned to the rate at which the material is reduced. The material is fed over an incline, and a hood extends from the bed over the proximate ends of the electrodes and upward over the inclined feed surfaces, whereby the waste heat from the arc and from the fused material is caused to act upon the incoming material.

—B. N.

Electric Furnace. A. C. Higgins, Worcester, Mass. U.S. Pat. 775,654, Nov. 22, 1904.

THE furnace consists of a base upon which is supported a removable, conical, unlined shell, forming the side walls of the furnace. Means are provided for lifting the shell, the furnace-charge being left entirely supported on the base. A stream of water is supplied at the top of the shell, and flows down the outer surface of the latter into a trough formed in the base, the cooling effect of the water causing the fused material within the furnace to form a lining on the inside of the shell.—A. S.

Gases; Apparatus for Electrically Treating —. K. Birkeland, Christiania. U.S. Pat. 775,123, Nov. 15, 1904.

SEE Fr. Pat. 335,692 of 1903; this J., 1904, 193.—T. F. B.

Barium Hydrate; [Electrolytic] Manufacture of —. F. Jahn, Ridley Park, Assignor to Harrison Bros. & Co. Philadelphia, Pa. U.S. Pat. 775,752, Nov. 22, 1904.

BARIUM sulphide solution is electrolysed "between" electrodes of which the anode is larger than the cathode, with interposition of a porous partition, whereby some of the

barium hydroxide is formed in the cathode compartment while the remainder and greater part is formed along with polysulphides in the solution in the anode compartment." The barium hydroxide is then recovered from the solution in the latter compartment.—E. S.

Paper Pulp; [Electrolytic] Production of —. J. Kitsee. U.S. Pat. 775,829, Nov. 22, 1904. XIX., page 1233.

FRENCH PATENTS.

Heating Agglomerated Materials under Pressure; Furnace for —. Galvanische-Metall-Papier-Fabrik Act.-Ges. Fr. Pat., 344,791, July 13, 1904. I., page 1203.

Foods, Flour, Milk, &c.; Process and Apparatus for Producing a Bleaching, Improving or Sterilising Agent for —. The Ozonised Oxygen Co., Ltd. Fr. Pat. 344,914, July 18, 1904.

AIR is passed through an ozoniser, and then quickly through a sparking apparatus, or *vice versa*. The mixed gases produced are employed for treating the articles to be bleached or preserved. In the case of flour, the treatment may be carried out in the apparatus described in Eng. Pat. 21,971, 1898 (this J., 1899, 1045).—W. P. S.

(B.)—ELECTRO-METALLURGY.

Electric Furnaces; Bibliography of —. First Period. Ad. Minet. Faraday Soc., June 2, 1904.

LABORATORY FURNACES (1808—1886).

Original Furnaces.

Davy. Voltaic Arc. Phil. Trans., 1813. Cathode Furnace. Phil. Trans., 1807—1810.
Pepys. Resistance Furnace of the Sixth Class. Cementation of Iron. Phil. Trans., 1815, 105, 370.
Napier. Cathode Furnace. Treatment of Copper Ores. Eng. Pat. 10,362 of 1844; 684 of 1845. Houston, J. Franklin Inst., 1889, 125, 376.

Electro-metallurgy of Aluminium.

Davy. Electrolysis of Alumina. Phil. Trans., 1808.
Monckton. Mixed Furnace, solid resistance at first, then liquid in course of operation. Eng. Pat. 264 of 1862.
Bunsen. Electrolysis of Fused Salts. Current Density. Conditions of the mass relatively to the elements constituting the electrolyte. Pogg. Annalen, 1854, 92, and 94, 612.
Deville (Henry Ste. Claire). Carbon and Aluminium Electrodes. Ann. de Chim., 1854, 43, 27. Aluminium, Paris, 1859, 95.
Le Chatelier. Carbon and Aluminium Electrodes. Eng. Pat. 1214 of 1861.
Gaudin. Cryolite and Sodium Chloride. Monit. Scient., 12, 63, according to Richards (Aluminium, 2nd Ed., London, 1890).
Kagenbuch. Clay with Flux and Zinc. Eng. Pat. 4811 of 1872.
Berthaut. Same process as Deville. Eng. Pat. 48,011 of 1879.
Graetz. Fused Chlorides and Fluorides. Crucible as Cathode. Reducing Gas. Ger. Pat. 26,962 of 1883.
Boguski-Zdziarski. Followed Graetz's process (1884).
Farmer. Cathode Crucible without Cover (1885).
Groussilliers. Closed Vessel under Pressure. Ger. Pat. 34,407 of 1885.
Grabau. Special Furnace. Ger. Pat. 45,012 of 1886.

Electro-metallurgy of Magnesium.

Bunsen. Fused Magnesium Chloride. Liebig's Annalen, 1852, 82, 137.
Matthiessen. Double Salt of Magnesium and Potassium. J. Chem. Soc., 8, 107.
Liebig. Application of Bunsen's Process (1852—1854). Borchers, Electro-metallurgy, Fr. Ed., 1896, 19.

Berthaut. Magnesium Chloride, Electrodes of Carbon and Magnesium. Eng. Pat. 4087 of 1879.
Gorup-Besanez. Double Chloride of Magnesium and Potassium. Lehrb. der anorg. Chem., 4th Ed., 517. Brunswick (1871).
F. Fischer. First Apparatus: Dingler's Polyt. J., 1882, 246, 28. Second Apparatus: Wagner-Fischer's Jahresb. der Chem. Techn., 1884, 1337. Handb. der Chem. Techn., 14th Ed., 344. Leipzig (1893).
Graetz. Double Fluorides and Chlorides, Cathode Crucible, Reducing Gas. Ger. Pat. 26,962 of 1883.

Electro-metallurgy of Lithium.

Bunsen and Matthiessen. Fused Chlorides. Liebig's Annalen, 1855, 94, 107.
Troost. Cast Crucible. Comptes rend., 1856, 43, 921. Ann. de Chim. Phys., 1856, 41, 112.
Hiller. Reducing Gas. Lehrb. der Chem., Leipzig (1863).
Grabau. Special Furnace. Ger. Pat. 41,494 of 1887.

Electro-metallurgy of Sodium.

Davy. Electrolysis of Alkaline Hydrates. Phil. Trans. 1807—1810.
Watt. Sodium Chloride. Eng. Pat. 13,755 of 1851.
Joblochkoff. Sodium Chloride. Dingler's Polyt. J., 1884, 251, 422.
Hoepfner. Apparatus. Ger. Pat. 30,414 of 1884.
Rogers. Preparation on a large scale. U.S. Pat. 296,357 of 1884.
Omolt. Preparation on a large scale. Ger. Pat. 34,727 of 1885.
F. Fischer. Wagner-Fischer's Jahresb., 1886, 222.

Electro-metallurgy of Potassium.

Davy. Electrolysis of Alkaline Hydrates. Phil. Trans., 1807—1810.
Matthiessen. Potassium and Calcium Chlorides. Liebig's Annalen, 1855, 93, 277.
Linnemann. Fused Cyanide of Potassium. J. prakt. Chem., 1848, 73, 425.

Calcium, Strontium, and Barium.

Davy. Electrolysis of Earthy-Alkaline Hydrates. Phil. Trans., 1807—1810.
Bunsen and Matthiessen. Electrolysis of Earthy-Alkaline Chlorides. Matthiessen, Liebig's Annalen, 1855, 93, 277; Bunsen, Current Density, Pogg. Annalen, 1854, 91, 619.
Matthiessen. Strontium. Liebig-Kopp's Jahresb., 1855, 323; J. Chem. Soc., 8, 107; Chemie de Gmelin-Kraut. Handb. der anorg. Chem., 2, 255, Heidelberg, 1886.
Feldmann, A. Strontium. Ger. Pat. 50,370. Borchers, Electro-metallurgy, 90.

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Despretz. Arc and Resistance Furnaces. Comptes rend., 1849, 29.
Pichon. Arc Furnace, Fusion of Minerals in 1853, according to Andreoli (Industries, 1893).
Johnson. Arc Furnaces, Fusion of Minerals, 1853. Eng. Pat. 700 of 1859; Cowles, Eng. Pat. 4004 of 1887.
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Huntington. Co-worker with Siemens in the researches on the Fusion of Metals. Minet, Traité d'Electrometallurgie, 275.
Clerc, Louis. Arc Furnace, Sun Lamp, Fusion of Lime. Fr. Pat. 1880; Bel. Pat. 144,397 of 1881.
Borchers. Resistance Furnace, Third Class. Reduction of Refractory Oxides, 1880. Production of Calcium Carbide. Borchers, Electro-metallurgy. 1st Fr. Ed., 1896; 2nd Ger. Ed., 1894.

Menges. Arc Furnace. Ger. Pat. 40,354 of 1886.
 Kleiner-Tiertz. Arc Furnace. Ger. Pat. 42,022 of 1886.
 Gerard-Lecuyer. Arc Furnace. Ger. Pat. 44,511 of 1886.
 Rogerson, Statter, and Stevenson. Arc directed by Magnetism. Fr. Pat. 183,987 of 1886.
 Farmer, G. Arc Furnace. Minet, *Traité d'Electrometallurgie*, 336.

Electrolytic Winning of Metals from Ores with Insoluble Anodes. St. Laszczynski. *Elektrochem.-Zeit.*, 1904, 11, 54—56.

In order to do away with the necessity of an ordinary diaphragm and at the same time overcome the difficulties due to oxidation at the anode, the author recommends a special cell for such electrolytic work. The essential peculiarity lies in closely surrounding the anode with a thick texture which hinders the diffusion of the ferrous and other oxidisable salts to the anode.—R. S. H.

Lead-Tin Alloys; Separation of Tin from Lead in —. L. Peetz. *Metallurgie*, 1904, 1, 281—297, and 336—345. *Science Abstr.*, A. 1904, 7, 931.

ATTEMPTS were made to remove the lead from lead-tin alloys by means of molten stannous chloride, or its double salts with alkali chlorides. Stannous chloride and its double salts are completely decomposed by lead, the rate of decomposition increasing with rise of temperature, but the decomposition is not complete in the case of lead-tin alloys, a state of equilibrium being reached. The losses of tin by volatilisation render the process useless practically. Tin can be separated from tin-lead alloys electrolytically by means of lead oxide in alkaline solution, alkali stannate being formed; the separation is possible in three days, using a temperature of 35° C. The alloy is best used in plates 1 mm. thick, in which case no loss of tin occurs.

—T. F. B.

ENGLISH PATENT.

Water-jackets, Casings and the like; Manufacture of — by Electrolytic means. A. F. Bosquet, Paris. Eng. Pat. 20,896, Sept. 28, 1904.

THIS invention relates to the manufacture of jackets, casings, &c., for the cylinders of explosion motors. The cylinder is provided with grooves for the reception of the jacket edges, the grooves being produced during the casting of the cylinder and afterwards treated with a sand jet. The jacket is formed of copper deposited from an ordinary electrolytic bath, after a preliminary coating from a bath of copper cyanide, the metal being deposited in the grooves and on a material, cast on the cylinder, which is fusible at a comparatively low temperature. The cylinder is afterwards placed in hot water or steam to melt the fusible metal, and thus leave a cavity for the circulation of water.—B. N.

Tantalum Metal; Purification of —. Siemens und Halske Akt., Berlin. Eng. Pat. 21,766, Oct. 10, 1904. Under Internat. Conv., Oct. 15, 1903.

IMPURE metallic tantalum powder is compressed into a bar or mass, which is heated electrically in a crucible of magnesia or thoria, lined with tantalum metal, a bar of the same being used as cathode. The apparatus is enclosed in a glass chamber in which a vacuum is maintained.

—E. S.

UNITED STATES PATENTS.

Gold; Extracting — from Ores [Cyanide Process]. H. R. Cassel, London. U.S. Pat. 775,597, Nov. 22, 1904.

THE powdered ore is agitated with a solution containing a cyanide and a haloid salt (a bromide or chloride of a suitable base) and the gold present is gradually and continuously transformed into a soluble cyanide by passage of an electric current at a stated high density. From the solution separated from the ore, the gold is precipitated and the haloid salt recovered, and to the residual solution a cyanide is added to fit it for re-use. Compare U.S. Pats. 732,708 and 732,709 of 1903; and 769,938 and 774,349 of 1904; this J., 1903, 915, and 1904, 939, 1151.—E. S.

Electrically Treating Materials; Method of —. W. S. Franklin. Assignor to F. Conlin, both of Bethlehem, Pa. U.S. Pat. 775,031, Nov. 15, 1904.

THE electric current is passed between electrodes, arranged within a chamber, and through molten slag which partially fills the chamber. The distance between the electrodes is caused to vary continuously so that an arc is formed at intervals between the upper electrode and the slag. The material is fed into the top of the chamber, first passing through the arc and then through the slag.—B. N.

Aluminium or other Metals; Process of Reducing —. H. S. Blackmore, Mount Vernon, N.Y. U.S. Pat. 775,060, Nov. 15, 1904.

AN oxygen compound or oxide of a metal, or metals, such as lithium and calcium, is maintained in a state of fusion, and an oxygen compound or oxide of a metal, such as aluminium, and having a less affinity for oxygen, is added to the fused mass. On passing an electric current, the metal with the lesser affinity for oxygen is liberated, an anode being used which will combine with the disengaged oxygen. The bath is replenished from time to time with the oxygen compound of the metal which is being liberated. The fusion of the mass may be maintained by an alternating current which does not yield metal, and by the simultaneous action of a direct current, the metal may be liberated at a temperature below the normal melting point of the oxide of the metal.—B. N.

FRENCH PATENTS.

Electric Furnace. P. Girod. Addition, dated July 4, 1904, to Fr. Pat. 329,822 of Feb. 28, 1903 (this J., 1903, 1054).

THE modification claimed in the present addition has for its object the circulation of the current through the largest possible portion of the available space of the furnace, and consists in separating the heating resistance into a number of circuits, arranged in any desired manner.—A. S.

Electric Furnace intended for the Transformation of Cast Iron into Steel. G. H. Gin. First Addition, dated Aug. 3, 1904, to Fr. Pat. 342,101 of March 30, 1904 (this J., 1904, 904).

THE main patent, relating to the refining of molten iron by running it into a gutter repeatedly curved upon itself, constituting the resistance in an electric circuit, is now supplemented in certain respects. The electrothermic heating of the metals and alloys is kept separate from the purifying reactions, in effecting the former mainly whilst the metal is in channels of small section, and the latter, whilst it is in basins successively reunited by the passing of the current along the heated channels. Thus, the current, in traversing the metal flowing in narrow sections heats it more highly than the metal which is traversing broad sections, or in re-united sections, such as may be made by merging some of the intervening section walls.

The narrow heating channels for the flow of the metal, are caused to start immediately from the steel masses which serve as poles to the current. These masses are cooled by a "peripheral" current of water. The bases of these blocks are guarded by cylindrical envelopes of bronze or of copper containing phosphorus, cooled by interior water circulation, to ensure electrical contact with the conductors, and reduce to a minimum the self-induction of the current.—E. S.

Zinc; Process for extracting — Electrolytically from Sulphate Solutions. Siemens und Halske Akt.-Ges. Fr. Pat. 345,154, July 27, 1904. Under Internat. Conv., Nov. 20, 1903.

SEE Eng. Pat. 16,396 of 1904; this J., 1904, 1098.

—T. F. B.

XII.—FATTY OILS, FATS, WAXES, AND SOAP.

Paraffin Wax; Admixture of — with Substances of Higher Melting Point. [Candle Making.] E. Graefe. III., page 1206.

ENGLISH PATENTS.

Waste Oil Filter. S. H. H. Barratt and the United Asbestos Co., Ltd., London. Eng. Pat., 21,452, Oct. 6, 1904.

THIS apparatus consists of a vessel divided into two or more compartments by means of vertical or nearly vertical partitions. A filtering medium of woven fabric, asbestos, &c., is stretched, across a grid placed over a hollow frame, in the partition, whilst a porous filtering mass within the frame is kept in position by means of a second grid (which may also be covered with a woven fabric), the pressure of which can be regulated by means of a screw or other device. The waste oil introduced through a strainer into one compartment, passes horizontally through the filtering media into the other compartment or compartments, so that there is but little accumulation of impurities on the filter.

—C. A. M.

Oil and the like; Apparatus for Purifying. C. A. Koellner, Neumühlen, Germany. Eng. Pat. 22,238, Oct. 15, 1904.

THIS apparatus, intended for the filtration of viscous oil, engine grease, etc., consists of two superposed chambers each of which contains filtering sheets kept apart by means of bars, frames, etc., and kept in position by means of a screw or other device. The oil enters at the bottom of the upper chamber, rises through the filter, and is then conducted to the top of the lower chamber through the filter, in which it passes downwards. The passage connecting the two chambers may be provided with a cover and observation window, and may end in a shoot to conduct the oil towards the middle of the top of the lower filter.—C. A. M.

Soap Preparations for use in Preventing Poisoning by Compounds of Lead, Copper, Arsenic, Mercury and other Metals; Process for making. F. Nusch, London. From Chem. Werke G. m. b. H., vorm. C. Zerbe, Freiburg in Baden. Eng. Pat. 18,152, Aug. 22, 1904.

THE ready decomposition on contact with air of soaps containing "sulphuretted alkali and hydrothionic acid," is prevented by coating the preparation with paraffin, soluble glass (alkali silicate), or the like, whilst the stability of the soap is increased by the addition to its ingredients of a substance such as vaseline, to counteract the influence of the air. (Compare Fr. Pat. 341,159 of 1904; this J., 1904, 82£.)—C. A. M.

FRENCH PATENTS.

Petroleum or Gasoline Soap, and Process for Manufacturing the same. L. A. Lebreton-Deshayes. Fr. Pat. 339,061, Sept. 29, 1903.

THIRTY-TWO kilos. of petroleum or gasoline, previously agitated with 16 kilos. of caustic soda lye, are stirred into 20 kilos. of melted animal or vegetable fat, and then 24 kilos. of caustic soda lye are added, with stirring. The soap is run into a suitable mould, which is transferred to a room heated to about 30° C. for about 24 hours, to complete the saponification.—T. F. B.

Soap; Manufacture of Neutral —, Keeping its Neutrality during Hydrolysis. P. Horn. Fr. Pat. 345,485, Aug. 11, 1904.

PRODUCTS of the artificial digestion of albuminoids with acids or alkalis ("albuminoses") are introduced into the soap, with the object of combining with free alkali already present or liberated during the hydrolysis of the soap by water.—C. A. M.

Soap Preparation for use as Protection against Lead Poisoning; Process for making a —. Chem. Werke Ges. m. b. H., vorm. Dr. C. Zerbe. First Addition, dated Aug. 13, 1904, to Fr. Pat. 341,159, Feb. 25, 1904.

SEE Eng. Pat. 18,152 of 1904; preceding there.—T. F. B.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(A.)—PIGMENTS, PAINTS.

UNITED STATES PATENTS.

Paint Composition. W. A. Hall, Bellows Falls, Vermont. U.S. Pat. 775,919, Nov. 29, 1904.

SEE Eng. Pat. 26,903 of 1903; this J., 1904, 328. T. F. B.

Oil Colour. M. Hérisson. Addition, dated July 28, 1904, to Fr. Pat. 337,440, Dec. 5, 1903. (See this J., 1904, 495.)

THE oil colour claimed in the main patent (*loc. cit.*) can be advantageously used in place of red lead, for a first coating on iron. The pigment is improved by decreasing the amount of barium chloride, and increasing that of zinc white, and it should be coloured by adding a little red ochre.—M. J. S.

(B.)—RESINS, VARNISHES.

UNITED STATES PATENTS.

Citrus Fruits; Process of Extracting Oleo-resin from the Peel of —. E. J. Sheenan, Assignor to San Gabriel Valley Essential Oil Co. U.S. Pat. 775,502, Nov. 22, 1904. XX., page 1237.

Citrus Fruits; Oleo-resinous Product from —. E. J. Sheenan, Assignor to San Gabriel Valley Essential Oil Co. U.S. Pat. 775,546, Nov. 22, 1904. XX., page 1237.

FRENCH PATENTS.

Amber; Process for Utilising Waste Yellow —. H. Thiemann. Fr. Pat. 345,196, July 15, 1904.

AMBER powder, turnings, and other waste are treated with chloroform, so as to obtain the soft α - and β -resins free from impurities. The addition of these resins to copal or amber of low quality produces a mixture suitable for the manufacture of ambroïde. Addition of a small quantity of succinic acid causes a cloudiness, by which the resemblance of the product to natural yellow amber is enhanced.—M. J. S.

(C.)—INDIA-RUBBER, &c.

Latex of Castilloa Elastica. A. W. K. de Jong. Ber., 1904, 37, 4398—4399.

THE substance which retards the coagulation of the latex of *Castilloa elastica* (this J., 1904, 990) has been found to be of an albuminoid character. It is precipitated by alcohol and acetone, but not by acetic acid, and its action is probably due to the adherence of the precipitate to the particles of caoutchouc, thus reducing the cohesive power of the latter. The author has also succeeded in detecting in the latex the presence of a tannic acid (calcium salt, $C_{34}H_{38}O_{20}Ca$), an acid, $(C_{17}H_{36}O_{10})_2$, potassium chloride, a sugar (m. pt. of osazone, about 200° C.), and a compound the neutral solution of which is coloured green.—A. N.

FRENCH PATENTS.

[Rubber] Latex; Process and Apparatus for the Treatment of —. P. F. E. Christiaens. Fr. Pat. 345,020, July 22, 1904.

THE latex is mixed with water and passed first through gauze tissue of fairly wide mesh to remove leaves, dirt, &c.; and then through one or two stretched cloths previously coated or sprinkled with a coagulating agent. The apparatus consists of three frames fitted one within the other, between the ends of which the cloths are stretched. The outer and inner frames are without bottoms, but the middle one has an openwork bottom of laths or bamboo.—A. S.

Vulcanised Rubber Waste; Regenerating —. A. Kittel. Fr. Pat. 344,734, July 9, 1904.

THE rubber waste is cut up into small pieces and incorporated with a dry powdered alkali capable of uniting with the

sulphur. The mixture is pressed, heated for 2–3 hours at 220°–280° C., and then treated in the usual manner in the case of waste containing a large proportion of loading material, powdered rosin may be added with the alkali.

—A. S.

XIV.—TANNING; LEATHER, GLUE, SIZE.

Tannin Extracts; Note on the Behaviour of Sulphites in —. R. Lepetit and C. C. Satta. Collegium, 1904, 311–313, 317–324.

THE results of a series of experiments on tannin extracts containing sulphites, lead the authors to confirm Parker and Gansser's view (this J., 1901, 1085), that such extracts have no injurious action on leather. It was found that in an extract of quebracho treated with bisulphite, a fairly large proportion of sulphate was always formed by oxidation, but only very little free sulphuric acid.—F. D. T.

Tannin Matters; Note on the Analysis of —. R. Lepetit. Collegium, 1904, 305–311.

THE author criticises the present official method of analysis, in that it does not take sufficient account of the values of "non-tannins," and takes no account of "insolubles," notwithstanding the fact that the latter include the phlobaphenes which enter largely into the composition of leather. The figures of analysis would be more exact if, instead of bringing the result to a hundred by obtaining one of the percentages by subtraction, the various determinations were all made direct.

A comparison of analyses of similar extracts made by several chemists last year showed considerable differences, although the same hide powder was used. The variations were evidently due not only to differences of manipulation, but also to the fact that insufficient care was taken when the samples were drawn. The author recently drew samples with great care from about two kilos of liquid extract, and also from dry extracts, which latter he pounded up finely and then passed through two sieves. Comparative analyses by several members of the I.A.L.T.C. showed then considerably less variation than in the case above cited. The author does not think it advisable to adopt, without restriction, the rule that all tannin solutions must be filtered before analysis, as many tanners rightly demand that there should be a certain quantity of insoluble matter present. In view of the increasing importance of extracts known as "soluble in the cold," the author proposes that the Congress should settle what the maximum amount of insoluble matter in these extracts should be.—F. D. T.

Gelatin; Setting and Swelling of —. P. v. Schroeder. Z. Phys. Chem., 1903, 45, 75–117. Science Abstr. A., 1904, 7, 914.

By heating a solution of gelatin at 100° C., its viscosity, measured at 25° C., gradually decreases to a constant minimum; this change is attributed to hydrolysis, and is accelerated by both hydrogen and hydroxyl ions (i.e., by addition both of acid and alkali), the final viscosities thus reached being lower than that obtained with a pure gelatin solution. The sulphates and chlorides of potassium, sodium, and ammonium, sodium nitrate, and the chlorides and sulphates of lithium and magnesium all increase the viscosity of gelatin solutions, the greatest increase being produced by magnesium salts. The vapour pressure of gelatin, after soaking in water, is found to be greater than that of water at the same temperature.—T. F. B.

Colloids [Gelatin, &c.]; Solution and Swelling of —. K. Spiro. Beitr. Chem. Physiol. Path., 1904, 5, 276–296. Science Abstr., 1904, A, 7, 922–923.

THE swelling of gelatin is considerably accelerated by hydrogen and hydroxyl ions (see von Schroeder, preceding abstract), and also by colloidal ferric hydroxide, even in presence of a substance such as dextrose. With a 3 per cent. solution of dextrose, the maximum swelling of gelatin is produced; with a 25 per cent. solution, no water is absorbed, whilst with more concentrated solutions, the gelatin loses

water and shrinks. Other substances, such as plates of agar, are not affected in the same way as gelatin. In a colloidal ferric hydroxide solution, obtained by prolonged dialysis (which contains an appreciable amount of chlorine), part of the substance is undoubtedly present in true solution, but the greater part is merely in suspension. Gelatin is affected less by dialysed than by "commercial" solutions of colloidal ferric hydroxide. The formation of a colloidal solution appears to require the presence of a small amount of an electrolyte.—T. F. B.

Nitrogenous Refuse [Leather Waste, &c.] and Waste Sulphuric Acid; Simultaneous Utilisation of —. E. Donath. XV., page 1228.

ENGLISH PATENT.

Tanning Leather; Process of and Apparatus for —. H. de Marneffe, Liège, Belgium. Eng. Pat. 22,395, Oct. 18, 1904.

SEE Fr. Pat. 339,428 of 1904; this J., 1904, 720.—T. F. B.

UNITED STATES PATENTS.

Hides; Machine for Applying Colouring Matter to —. R. W. Churchill. U.S. Pat. 774,935, Nov. 15, 1904. VI., page 1213.

Leather; Process of Treating [Waterproofing] —. P. Magnus, Collingwood, Victoria. U.S. Pat. 775,839, Nov. 23, 1904.

SEE Fr. Pat. 331,239 of 1903; this J., 1903, 1140.—T. F. B.

FRENCH PATENTS.

Tannin Extracts; Process for the Clarifying of —. Soc. des Extraits de Chêne en Russe. Fr. Pat. 339,064. Sept. 25, 1903.

THE tannin liquors are treated with finely-pulverised neutral bodies such as sand, clay, kaolin or barium sulphate. The latter carry down insoluble matters in suspension, thereby rendering the extracts clear.—F. D. T.

Skins; Process for the Tanning of —. E. L. Alilaire. Fr. Pat. 345,002, July 21, 1904.

THE skins are tanned with liquors extracted from peat. It is claimed that skins so treated are especially supple and strong.—F. D. T.

Leather; Artificial —, and Method of Making the same. J. B. Granjon and J. F. J. Berchet. Addition, dated Aug. 5, 1904, to Fr. Pat. 343,704, June 4, 1904 (this J., 1904, 1036).

THE artificial leather prepared according to the process described in the main patent, is coated (before the tar is quite dry) on one or both sides with a sheet of paper, cardboard, textile fabric, or metal.—A. S.

Size Glue; Manufacture of a Special —. C. Vienne and F. Kowachiche. Fr. Pat. 339,098, Oct. 14, 1903.

FROM 1–20 per cent. of zinc oxide is added to the hot solution of glue, and after well agitating, the liquor is passed through a sieve and cooled in moulds. It is claimed that the resulting glue, which is white and opaque, has a tensile breaking strength 20 per cent. greater than that of ordinary glue, whilst size prepared from it has a resistance to moisture, 30 per cent. greater than ordinary glue size.—A. S.

XV.—MANURES, Etc.

Calcium Phosphates; Action of Water on the —. F. K. Cameron and A. Seidell. J. Amer. Chem. Soc., 1904, 26, 1454–1463.

BOTH tricalcium phosphate and monocalcium phosphate are considerably hydrolysed and decomposed by the action of water. In both cases, the amount of decomposition and the concentration of the resulting solution at the temperature employed in the authors' experiments (25° C.) is

dependent on the ratio between the amounts of solid phosphate and water. Dicalcium phosphate, however, is only slightly decomposed by water and appears to dissolve mainly as such, so that it is the only phosphate of calcium stable in water under ordinary conditions.

The presence of calcium sulphate slightly increases the phosphoric acid dissolved from tricalcium phosphate, produces probably a slight increase with the monocalcium salt, but a marked decrease with dicalcium phosphate; calcium carbonate diminishes the phosphoric acid dissolved from all three phosphates. Carbon dioxide increases the phosphoric acid dissolved from tri- or di-calcium phosphate, but is without apparent effect on the action of water on the monocalcium salt.—T. H. P.

Lignite-tar Distilleries; Use of Waste Liquors from— as Manure. F. Strube. Z. angew. Chem., 1904, 17, 1787.

In spite of repeated trials, no method of treatment for these waste liquors has yet been found which will render them inoffensive at a practicable cost; usually they are diluted by being run into neighbouring streams. The author has, however, successfully applied them for manurial purposes. Two portions of land were treated similarly in all respects save that one was regularly sprinkled, by means of spray-diffusers, with these waste liquors, and the other not. The yield of oats on the sprinkled portion was represented by the figures 44.5 grain, 79.0 straw, 11.0 chaff, while the corresponding figures for the other portion were 38.0, 61.5, 8.0; the grain from the sprinkled portion contained 2.13 per cent. of nitrogen, that from the other 1.67 per cent., so that the total yields of nitrogen from the two portions were very nearly in the ratio of 3 to 2.—J. T. D.

Nitrogenous Refuse [Leather Waste, &c.] and Waste Sulphuric Acid [from Petroleum Refining]; Simultaneous Utilisation of —. E. Donath. Chem.-Zeit., 1904, 28, 1153—1154.

WHEN nitrogenous substances such as leather, wool, hair, horn, &c., are heated at about 300° C. with 30—50 per cent. of sulphuric acid and afterwards extracted with water, considerable amounts of ammonium sulphate are obtained, whilst the carbonised residues, according to the nature of the substance employed, may be utilised as a decolorising agent, or, if unsuitable for this purpose, may be utilised for the production of potassium ferrocyanide. For the first operation it is proposed to employ waste sulphuric acid from the purification of petroleum. In an experiment in which leather meal (220 grms.) was treated with sulphuric acid, 3.86 grms. of ammonia were obtained; and of the total nitrogen only 2.5 per cent. was lost. In another experiment, however, the loss was much greater. The carbonised residues contained from 4 to 10 per cent. of nitrogen.—N. H. J. M.

ENGLISH PATENT.

Fertiliser or Manure; Manufacture of —. H. Myers, Burton-on-Trent. Eng. Pat. 494, Jan. 8, 1904.

CLAIM is made for a mixture consisting of pressed brewers' yeast (20 to 30 parts), oak sawdust (15 to 20 parts), powdered lime (25 parts), bone dust (10 to 20 parts), basic slag (10 parts), and sodium sulphate (10 parts). After blending, the mixture is passed through a revolving cylindrical wire riddle.—C. A. M.

XVI.—SUGAR, STARCH, GUM, Etc.

[Sugar]; Carbonating and Systematic Washing of Filter-press Scums. A. Aulard. Bull. Assoc. Chim. Sucr. et Dist., 1904, 22, 299—312.

In order to secure perfect washing of filter-press scums, the juice must have been well treated with lime, and the first carbonating carried out at about 70° C. The pressure at the filter-presses should not exceed two atmospheres. The water used, is the ammoniacal water from the third and fourth bodies of the multiple effect, cooled to 45°—50° C. It should be put into the press at from 1 to 1.5 atmospheres pressure. When the presses are not arranged for absolute displacement of the juice as in those of the Fives-Lille Co., and there is consequent mixing of water and juice, it is of

advantage to return part to serve as water of displacement for the succeeding operation. For liming, sufficient water only should be used to bring the slaked lime to from 32° to 34° B. There is no reason against the use of a dense milk of lime when the mixing of the diffusion juice in the cold with lime lasts at least an hour.—L. J. de W.

Sugar Solutions; Boiling Points of Pure and Impure —. H. Claassen. Zeits. Ver. Deutsch. Zuckerind., 1904, 54, 1159. (See this J., 1904, 1105.)

Sugar or Dry Solids.	Boiling Points of Pure Sugar Solutions.				Rise in the Boiling Point in °C. for a Purity of— (Claassen and Hermann.)				
	Gerlach.	Flourens.	Claassen and Frenzel.		100.	93.	83.	73.	62.
Per Cent.									
5					0.05	0.05	0.05	0.05	0.05
10	100.4	100.1	100.1	0.1	0.1	0.1	0.15	0.2	0.2
15				0.2	0.2	0.25	0.25	0.35	0.35
20	100.6	100.3	100.3	0.3	0.3	0.35	0.40	0.5	0.5
25				0.45	0.45	0.5	0.6	0.75	0.75
30	101.0	100.6	100.6	0.6	0.65	0.7	0.85	1.1	1.1
35				0.8	0.85	1.0	1.2	1.5	1.5
40	101.5	101.1	101.1	1.05	1.15	1.35	1.6	1.95	1.95
45				1.4	1.55	1.75	2.1	2.5	2.5
50	102.0	101.9	101.9	1.8	2.0	2.25	2.7	3.15	3.15
55				2.3	2.6	3.0	3.6	4.0	4.0
60	103.0	103.1	103.0	3.0	3.3	3.8	4.6	5.0	5.0
65				3.8	4.25	4.8	5.6	6.2	6.2
70	106.5	105.3	105.3	5.1	5.4	6.2	7.0	8.0	8.0
75	109.0	107.4	107.3	7.0	7.3	8.5	9.2	10.3	10.3
80	112.2	110.4	..	9.4	10.0	11.4	12.3	13.6	13.6
85	117.5	114.9	..	13.0	13.4	15.9	16.9	18.2	18.2
90	127.0	122.6	..	19.6	(20.0)	(22.0)	24.7	26.9	26.9
92	..	127.9	..	..	..	..	..	..	..
94	..	..	..	30.5	..	..	..	..	..

—L. J. de W.

Sugar in Solutions of Tannin; Presence of —. H. Nové. Bull. Assoc. Chim. Sucr. et Dist., 1904, 22, 325—326.

THE author finds that alcoholic solutions of tannin, frequently used along with lead acetate to clarify and decolorise sugar solutions for polariscope readings, especially after being kept some time, may contain dextrose and consequently affect the accuracy of the results. The natural glucosides present in some tannins are decomposed into dextrose and gallic acid. The use of concentrated solutions of tannin is therefore condemned.—L. J. de W.

Starch-Glucose Syrups prepared by Hydrochloric Acid; Suitability of — for Confectionery. E. Preuss. Z. Spiritusind., 1904, 27, 478.

GLUCOSE which has been prepared with hydrochloric acid, as the American confectioners' glucose is, must never be neutralised with chalk, but always with sodium carbonate. The author has ascertained experimentally that the resulting sodium chloride is without any inverting action upon the cane sugar in the process of boiling confectionery. The proper use of sodium carbonate also decomposes any calcium chloride which may be produced by the action of the acid upon the ash of the starch; well neutralised syrups never contain calcium chloride. Further, the author shows that it is not necessary to use higher temperatures when converting with hydrochloric acid, than when sulphuric acid is employed. In practical work a temperature of 120°—130° C. or a pressure of one atmosphere is never exceeded, on account of the danger of reversion. Syrups properly prepared with hydrochloric acid are no less suitable for confectionery than those made with sulphuric acid, and any defects observed are really attributable to the presence of abnormal products due to conversion at excessively high temperatures or to incorrect neutralisation, filtration, or decolorisation.—J. F. B.

Aldoses; Separation of — by Secondary Hydrazines. R. Ofner. Ber., 1904, 37, 4399—4402. (See also this J., 1904, 993.)

THE author has succeeded in preparing in acetic acid solution the methylphenylhydrazones of dextrose and

xylose, and the benzylphenylhydrazone of xylose, although hitherto it has only been possible to produce these derivatives from neutral solutions. The following is the method adopted for the preparation of the methylphenylhydrazone of dextrose. Two grms. of dextrose are well mixed with 5 c.c. of 50 per cent. acetic acid, 1.8 grms. of methylphenylhydrazine are added, and the mixture is allowed to stand at the ordinary temperature in a closed flask with occasional shaking. The whole of the sugar gradually passes into solution, and from the deep red liquid, the hydrazone separates after about two hours in the form of colourless needles. After a further hour, the crystalline mass is repeatedly digested with ether, pressed on an earthenware plate and re-crystallised from alcohol. The yield of pure hydrazone is 50 per cent of the theoretical amount.—A. S.

Beetroots; Direct Determination of Sugar in —. Non-Influence of Air on the Results. H. and L. Pellet. XXIII., page 1241.

Beetroot Juice; Determination of the Purity of —. H. Schulz. XXIII., page 1241.

Maple Syrup and Maple Sugar; Composition, Analysis and Adulteration of —. J. Hortvet. XXIII., page 1241.

Denaturing Sugar for Use in the Brewery; Directions for —. XVII., page 1230.

Sugars; Reaction of Aldehydic —. A. Berg. XXIII., page 1240.

Starch-containing Materials; Method of Distinguishing between Different — by means of Iodine Vapour. A. Dubosc. XXIII., page 1240.

ENGLISH PATENTS.

Achroo-Dextrin; Manufacture of — [from Peat]. G. Reynaud, Paris. Eng. Pat. 4792, Feb. 26, 1904.

SEE U.S. Pat. 761,542 of 1904; this J., 1904, 721.—T. F. B.

FRENCH PATENTS.

Beet Sugar; Process for Manufacturing —. M. Roeseler, A. Schaefer, and H. W. Hinze. Fr. Pat. 345,299, Aug. 1, 1904.

SEE U.S. Pat. 770,700 of 1904; this J., 1904, 994.—T. F. B.

Sugar or Diffusion Juices; Purification of Crude —. Vve. H. Breyer (née Mitterbacher) and A. J. von Wehrstedt. Fr. Pat. 345,463, Aug. 8, 1904.

AN intimate mixture, consisting of two parts of calcium hydroxide with one part of powdered brick, is added to the crude sugar juice at a temperature of 80° C. in the proportion of 2.5 to 3.0 per cent. on the weight of the beetroots. The mixture is agitated mechanically, whilst it is saturated with carbon dioxide.—J. F. B.

Sugar; Rapid and Economical Process of Refining —. J. B. L. Auriensis and R. Fontenilles. Fr. Pat. 345,261, July 26, 1904.

SUGAR of the quality known as No. 3 or "extra," is melted with water in such proportions and at such a temperature that the syrup, after cooling to about 30° C., contains at least 60 per cent. of refined crystals produced by suitable "malaxage." The syrup drained off from this mass is utilised for melting a second batch of sugar, with the addition of the necessary quantity of water. When the drained syrups become too highly coloured, they are decolourised and returned for re-melting. Any concentration of the syrups is avoided. The crystallised refined mass is drained in the centrifugal machines, mixed with hot, saturated, "clairce" syrup, and moulded in any suitable manner. The refuse from the moulded sugar is remelted.—J. F. B.

Viscous Materials [Molasses]; Apparatus for Drawing off —, the Draw-off Cock being Automatically regulated by a Float. B. Gäde. Fr. Pat. 344,724, June 21, 1904.

THE viscous material is drawn off from a tun into a vessel, and as this fills, it raises a float connected by means of a lever to a weight. When the vessel is full, the weight is released and closes the draw-off cock.—L. F. G.

Molasses, Vinasses, Saccharine Juices, and other Vegetable Extracts; Production of Dyestuffs from —. O. Wichardt. Fr. Pat. 345,440, Aug. 9, 1904. IV., page 1211.

Betaïne or its Salts from Molasses; Process for Extracting —. C. Stiepel. Fr. Pat. 344,954, July 19, 1904.

CONCENTRATED molasses is intimately mixed with twice its volume of 95 per cent. alcohol. The mixture is allowed to settle, and the alcoholic layer is decanted off, filtered, and decolourised by animal charcoal. It is then concentrated to a syrupy consistency, treated with strong hydrochloric acid, and cooled; the crystals of betaïne hydrochloride which separate out, are subsequently purified by recrystallisation from alcohol.—J. F. B.

Starch [Amyloid]; Manufacture of — from Cellulose, Wood, &c. A. Börner. Fr. Pat. 345,370, Aug. 4, 1904.

SAWDUST or other waste vegetable material is digested for 48–60 hours with a suitable acid or alkaline solution. The most suitable solvent consists of a 1–2 per cent. solution of caustic soda, with which the sawdust is systematically extracted in a diffusion battery at a temperature of about 24° C. The extract is freed from resins, &c. by acidulation, and the "starch" is precipitated from the clarified solution by saturating the latter with common salt. The separated "starch" may then be saccharified by acid, and converted into alcohol by fermentation and distillation.—J. F. B.

XVII.—BREWING, WINES, SPIRITS, Etc.

Culture Yeasts; Researches on — in the Moist and Pressed Condition. W. Henneberg. Woch. f. Bran., 1904, 21, 625–629, 654–660, 668–675, 683–686, 711–716, 731–740, 747–751, 759–763.

CONCLUSIONS are summarised setting forth the results of a long series of investigations on the behaviour and longevity of quiescent yeast cells and the influence of foreign organisms on yeast, including a study of spontaneous infection, decomposition, and putrefaction of preserved yeast. The experiments were carried out (1) with absolutely pure cultures, and (2) with pressed industrial yeast. A comparison of these two series showed that, in the bulk, the pure cultivated yeast lived for a shorter time than the industrial cultures, but that frequently a few cells of the pure cultures survived after the whole of those of the industrial cultures were dead. Variations in the relative longevity of the two kinds of cultures were observed, according to the temperature of storage and the race and type of the yeast. In pure cultures the bottom yeasts lived longer than the top yeasts, but in industrial cultures the reverse was the case; the two types of yeast are, however, not really comparable. In pure cultures there was frequently a slight reproduction, but scarcely any in the industrial cultures. In pure cultures of Races II. and XII. the presence of excess of moisture was very injurious, but in industrial cultures much less so. Exclusion of air by means of a layer of paraffin was found to be unfavourable in pure cultures of Race XII., but favourable in industrial cultures. Industrial cultures of Race XII. often contained spores, whereas the pure cultures of this variety were always devoid of them. Infection by *Oidium lactis* is very destructive in pure cultures, but in industrial cultures of the distillery yeasts, this fungus forms a protective film with distinctly favourable effects. Sulphuretted hydrogen (due to infection) was produced only in the industrial cultures; the latter

also were proof against putrefactive bacteria and hay bacilli. Generally, it may be said that the life of moist yeast cells in the quiescent state is comparatively short, especially at high temperatures. The life of the cell is cut short by the accumulation in the restricted space of the pressed mass, of poisonous products of metabolism, or by foreign organisms. In order to obtain a culture which will remain alive for a considerable time, it is necessary to select a suitable race of yeast and to cultivate it under conditions which will induce a vigorous growth, as free as possible from infecting organisms.—J. F. B.

Denaturing Sugar for Use in the Brewery; Directions for —. Z. Ver. Deutsch. Zucker Ind., 1904, 54, [Gen. Part], 408. (See this J., 1904, 1053.)

In accordance with the law of July 5, allowing the use of duty-free sugar for brewing purposes in France, the following two methods of denaturing the sugar were sanctioned on October 1:—(1) A mixture is made in the following order of 1000 kilos. of drinking water, 2 kilos. of syrupy, purified commercial phosphoric acid of sp. gr. 1.45, 1000 kilos. of sugar or syrup, and 20 kilos. of hops. The mixture is brought to the boil. After boiling for 15 minutes, the density of the boiling liquid is taken with a hydrometer, and boiling continued until it has reached 1.26. The syrup poured off, must have a density of 1.32. (2) A mixture is made in the following order, 1000 kilos. of drinking water, 4 kilos. of crystallised tartaric acid, 1000 kilos. of sugar or syrup, and 20 kilos. of hops. The rest of the procedure is as under (1).—L. J. de W.

[Brewing.] *Action of Disinfectants on Beer Incrustation.* V. Törnell and E. Morell. Z. ges. Brauw., 1904, 27, 844—846.

EXPERIMENTS were made on the incrustation found in the main leading from the hop-back to the cooler. The substance which contained 9.4 per cent. of moisture and was soluble to the extent of 14½ per cent. in water, was crushed and exposed to the action of the reagents (20 c.c. per 0.4 gm. of substance) for an hour, then stirred and left for a similar period, the insoluble residue being finally collected on a tared filter, washed with 300 c.c. of water and dried at 100° C. "Antiformin" (in which the active substance is hypochlorous acid, and which contains 5.2 per cent. of sodium hydroxide) dissolved 97 per cent. of the incrustation with brisk effervescence, the chlorine decolorising the solution. On the other hand, a 5 per cent. solution of caustic soda, dissolved only 23 per cent., so that the more vigorous action of the first-named reagent must be ascribed to the active chlorine, though in the case of sodium hypochlorite and bleaching powder, this activity was less pronounced (64.4 per cent. and 39.7 per cent. respectively). Sodium and potassium carbonates act more by loosening the incrustation than as solvents, only 20 per cent. being dissolved by solutions of 2½—10 per cent. strength. Potassium bisulphite increases the insolubility of the incrustation in water by nearly 2 per cent., and also hardens the crust—a behaviour explaining the known fact that vats treated with this reagent incrust sooner and more firmly than otherwise. The same result, but in still higher degree, is furnished by "montanin," which actually increases the insolubility by 25 per cent., and is therefore entirely unsuitable as an anti-incrustant. Ammonium bifluoride (0.5—1 per cent. solution) dissolves only about 1 per cent. more than water. It is therefore concluded that oxidising agents alone, do not exert any powerful solvent action on the incrustation.—C. S.

Distillery Yeast Mash; Heating the — to 75°—81° C. after Acidification. Schirmann. Z. Spiritusind., 1904, 27, 478—479.

THE heating of the preliminary yeast mash to a temperature of 75—81° C., after acidification by lactic acid bacteria and before sowing the yeast, is always recommended as a safeguard for destroying any undesirable bacteria which may have developed along with the lactic bacteria. The author, however, questions the utility of this partial sterilisation, because its good effects may be outweighed by its ill effect on the

nutrition of the yeast. He contends that if the lactic fermentation has taken place under favourable conditions of purity, the heating is unnecessary, and that it is quite likely, by its action upon the albuminoids and enzyme-constituents of the mash, to modify the composition of the liquid in a direction unfavourable to the yeast. He claims that it is possible to judge whether an acidified yeast mash is in such a condition as to require heating for sterilisation purposes, or whether this heating may be omitted with advantage to the yeast. Henneberg, commenting on the above, points out that there are some kinds of "wild" lactic bacteria which develop well under the same conditions as the "cultivated" species, and that these are capable, in sufficient quantities, of exerting a disastrous effect upon the yield of spirit. It is very doubtful whether it is possible in practice to distinguish the presence to a dangerous extent of these harmful bacteria, and the pasteurisation of the mash must be regarded as a necessary safeguard.—J. F. B.

Distillery Fermentation Tuns; Attenuators for —. G. Heinzelmann. Z. Spiritusind., 1904, 27, 477.

ATTENUATORS are of two kinds, the stationary and the movable. The copper pipes of the stationary coils should be flattened or oval in section, since their sole function is to cool the mash. The pipes of the moving coils should on the other hand be round in section, since flattened pipes in their spiral path cut through the mash without making a sufficient path for the escape of the carbon dioxide, which is the chief object of their motion. The speed of rotation should be 13 to 20 revolutions per minute, and the up and down stroke should be about 3 ft. in length. The coils should never be so adjusted that they break through the surface of the mash as they rise, as thereby a loss of alcohol would occur. The attenuators must be kept perfectly clean, and there should be no projections or corners to which particles of stale mash may adhere and so cause infection; any leakage of water from the inside of the coils may also introduce infecting bacteria. Mere spraying is not sufficient to remove the slimy deposit of yeast which collects on the coils; these should be scrubbed as frequently as possible with milk of lime.—J. F. B.

Rum distilled in British Guiana; Proportion of Esters normally Present in —. J. B. Harrison. British Guiana Official Gazette, Oct. 19, 1904.

FROM the results of analysis of a number of "estate" rums and of "bush" rums (the products of illicit distilleries), it is concluded that rum as at present manufactured in British Guiana is subject to a wide range of variation in its contents of esters (calculated as ethyl acetate), the numbers obtained varying from 12 to 80 parts for estate rums and for bush rums from 24 to 115 parts per 100,000 of alcohol by volume. The mean contents of esters in the rum exported from the colony during the past three years have varied from 64.7 to 104 parts, the mean for the total export being 83.5 parts. Rum distilled by means of continuous and of Coffey stills contains a mean of 44.9 parts of esters with 18.4 parts of acids; that from vat stills, 69.9 parts of esters with 33.1 parts of acids. The results here given offer no support to the theory that rum can be judged as to its freedom from admixture with silent spirit by the amount of esters present.—T. H. P.

Trehalase; Presence of — in Mushrooms. E. Bourquelot and H. Hérissé. XXIV., page 1243.

Rusting of Iron [by Denatured Spirit]; Stimulating and Paralyzing Effects of certain Substances on —. L. Lindet. X., page 1219.

ENGLISH PATENTS.

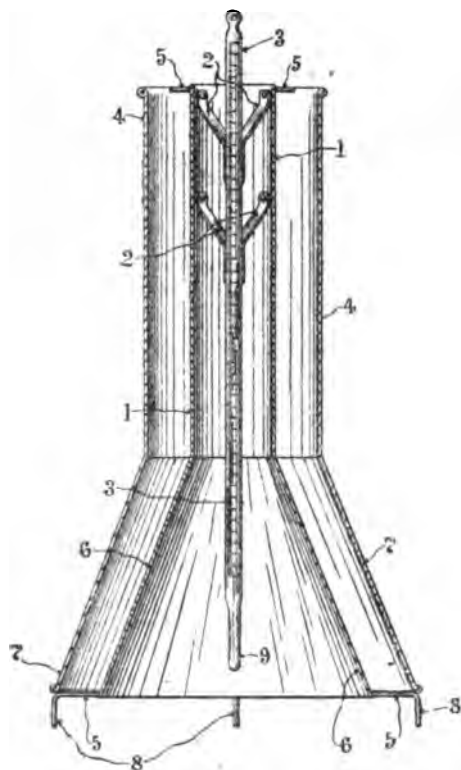
English Beers or Malt Liquors; Manufacture of —, and Production of Pure Yeast Cultures for use therein. N. H. Clauseen, Copenhagen. Eng. Pat. 28,184, Dec. 23, 1903.

CLAIM is made for the employment in the manufacture of English beers, such as ale, stout, and porter, of cultures of

a new species of micro-organisms, which are termed brettanomyces and which do not form endospores, in order to produce the flavour and condition peculiar to such beers. The brettanomyces may be added after the primary fermentation or after pasteurisation, or may be mixed with the pitching yeast.—T. H. P.

Temperature of Kilns or other Hot-Air Chambers used in Drying Grain and like Materials; Apparatus for Indicating the —. A. J. Murphy, Leeds. Eng. Pat. 967, Jan. 14, 1904.

THIS apparatus consists of a casing 1, provided with internal spring clips 2, for holding a thermometer 3 centrally within the casing, 4 being an external shield or jacket which is held concentrically outside the casing 1 by distance pieces, 5. The bases of the casing 1 and shield 4 are opened out into trumpet bases 6 and 7, and feet 8, are provided, which



are placed in perforations in the floor of the kiln. When the apparatus is placed on the floor of the kiln, the gases are free to ascend and pass in close contact with the bulb 9, of the thermometer, without being altered in temperature by contact with the walls of the apparatus in contact with the grain.—T. H. P.

Fertilizer or Manure [from Brewers' Yeast]; Manufacture of —. H. Myers. Eng. Pat. 494, Jan. 8, 1904. XV., page 1228.

UNITED STATES PATENTS.

Malt Kiln. C. E. Glafke, San Francisco. U.S. Pat. 774,915, Nov. 15, 1904.

A KILN-FURNACE provided with grate-bars for burning coke, is combined with a supplemental horizontal flue, U-shaped in vertical cross-section, opening into the furnace. A jacket surrounds the top and sides of the horizontal flue at such a distance that an air chamber is thus formed, which opens into the furnace; there is also an air chamber below the floor of the horizontal flue. Liquid fuel is supplied at the end of the horizontal flue furthest removed from the furnace.

—J. F. B.

Brewing; Art of —. J. Schneible, Weehawken, N.J. U.S. Pat. 775,780, Nov. 22, 1904.

SEE Eng. Pat. 14,028 of 1904; this J., 1904, 996.—T. F. B.

FRENCH PATENTS.

Phlegms, Wines, and Alcoholic Liquors generally; Continuous Rectification of —. A. Baudry. Fr. Pat. 339,079, Oct. 2, 1903. (See also this J., 1904, 1107.)

TWO distillation columns are provided, the first serving for the separation of the volatile impurities, gases, &c., from the phlegms or wine as far as possible, and the second serving for the separation of volatile impurities from the liquor returned from the rectifying column. The second distillation column may be heated by the latent heat of the alcoholic vapours of the separating column. The volatile impurities from the two distillation columns concentrate themselves on certain plates of a "double" column, leaving a distinct "neutral zone" practically free from impurities. The alcoholic liquid from the "neutral zone" is divided into two parts, one descending into the lower portion of the double column and concentrating the fusel oil products on certain plates, whilst the other is mixed with the phlegms or wine in the first distillation column.—J. F. B.

Spirits; Manufacture of Naturally Perfumed and Aromatic —. H. Pape and G. Defourneaux. Fr. Pat. 339,085, Oct. 6, 1903.

A SELECTED species of yeast, isolated from sugar canes and cultivated in the pure state, and rendered more active by special treatment, is utilised for the production of fine rum from sugar-cane molasses. The same yeast can be utilised for the fermentation of mashes prepared from beetroot products or saccharified grains, with the addition, if desired, of vinasses derived from sugar-cane products. The fermented mashes are distilled in rectifying columns, and the various distillates are selected or blended.—J. F. B.

Alcoholic Vapours; Recovery of — from other Volatile Products. J. Jean et Cie and G. Raverat. Fr. Pat. 345,138, July 25, 1904.

THE alcoholic vapours, mixed with air or other gases, are passed through columns containing concentrated sulphuric acid. The acid absorbs the alcohol, which is subsequently recovered by diluting with water.—J. F. B.

Wines, Musts, Ciders, &c.; Apparatus for Determining the Dry Extract and the Alcohol in —. A. B. Darbois. Fr. Pat. 345,455, July 28, 1904. XXIII., page 1239.

Marks and Grapes [Alcohol and Cream of Tartar]; Process and Apparatus for Treatment of —. Egrot, Grangé et Cie. Fr. Pat. 344,737, July 9, 1904.

THE fermented marks are charged into a battery of closed diffusion vessels elongated in form and of small diameter, and capable of withstanding a high pressure. The marks are extracted in these vessels, first by cold or warm water under pressure, and subsequently by hot water heated under pressure to a temperature above 100° C. The cold water extracts the alcohol, whilst the hot water dissolves the cream of tartar. The same apparatus may be used for extracting the must from the vintage before fermentation, or for the extraction of the wine from the fermented lees.—J. F. B.

Marks of Wine or Fermented Products; Recovery of Alcohol from —. G. Ciapetti. Fr. Pat. 344,880, June 18, 1904.

REFERRING to a previous patent (this J., 1903, 1099), the batteries in which the marks are treated with sulphurous acid and hydrosulphurous acid for the extraction of cream of tartar, are connected with a distilling and rectifying apparatus in which the alcoholic vapours, expelled from the marks before their extraction, are separated into refined spirits and common spirits, both, at a high concentration. (See also this J., 1904, 1039.)—J. F. B.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(A.)—FOODS.

Flour; Bleaching of — E. Fleurent. Comptes rend., 1904, 139, 945—946.

THREE processes are in use for bleaching flour, depending on the use respectively of ozonised air, of air charged with chemically prepared nitrogen peroxide, and of air charged with nitrogen oxides obtained by the spark discharge through it. If these processes merely changed the colour of the flour they would not be worth using; but experiment has shown, it is stated, that by their influence on the transformations of the fatty matters, on the acidity, on the diastatic power, and on harmful micro-organisms, they allow an increased amount of superior flour to be extracted, and improve its keeping qualities.—J. T. D.

Cows' Milk; Nutritive Value of — Sterilised at 108° C. G. Variot. Comptes rend., 1904, 139, 1002—1003.

DURING the last twelve years about 400,000 litres of cows' milk, sterilised at 108° C. in hermetically sealed bottles, have been sent out in France. The results show that such milk maintains the whole of its nutritive value, whilst its assimilability is not appreciably changed.—T. H. P.

Straw Pulp and Cattle Fodder. Lehmann. XIX., page 1233.

ENGLISH PATENT.

Milk Powder; Manufacture of — G. H. Rayner, London. From J. Maemecke, Berlin. Eng. Pat. 6720, March 19, 1904.

MILK is first pasteurised, then filtered, and rendered homogeneous. During this time the quantity of calcium separated as an insoluble compound is determined, and a corresponding amount of a calcium compound (calcium combined with a higher alcohol, or sugar) is added to the milk, which is evaporated under reduced pressure to about one-fifth of its volume. The thick liquid obtained, is then completely dried in layers of about 5 mm. thickness in flat-bottomed pans. The dry product is powdered. The latter is soluble, and it is claimed that it does not become rancid on keeping.—W. P. S.

UNITED STATES PATENT.

Preserving and Disinfecting; Method of — A. Müller Jacobs, Brooklyn. U.S. Pat. 775,066, Nov. 15, 1904.

DECOMPOSABLE matter is preserved and disinfected by subjecting it to the action of zirconium compounds (which possess radio-active functions) by immersing the matter in a suitable solution of the salts of zirconium.—J. F. B.

FRENCH PATENTS.

Gluten; Process and Apparatus for Drying and Bleaching — L. A. Morel. Fr. Pat. 344,631, July 6, 1904.

THE gluten, in the form of cakes, is placed upon electrically heated plates under the receiver of an air-pump. Pasty gluten is filled into tubes which stand on the plates. The temperature of the latter is controlled by means of a special thermostat. Absorbing materials contained in vessels surrounded by cold water are placed under the receiver and a stirring apparatus for the absorbent is actuated by connections with the handle of the air pump.—W. P. S.

Foods—Flour, Milk, &c; Process and Apparatus for Producing a Bleaching, Improving or Sterilising Agent for — The Ozonised Oxygen Co., Ltd. Fr. Pat. 344,914, July 18, 1904. XI. A., page 1224.

Lac Derivative [Lining Preserved Food Tins], and Process for Manufacturing the same. W. S. Bucklin. Fr. Pat. 345,174, July 28, 1904.

SEE Eng. Pat. 16,800 of 1904; this J., 1904, 1154.—T. F. B.

(B.)—SANITATION; WATER PURIFICATION.

Arsenical Poisoning; Danger of — to Workmen Engaged in Autogenous Soldering. G. Lunge. X., page 1220.

Calcium Soaps; Dissolving — by Means of Ammonium Citrate. Justin Mueller. V., page 1211.

ENGLISH PATENTS.

Sterilising Liquids, particularly Water; Process for — R. Cambier, A. Tixier, and C. E. Adnet, Paris. Eng. Pat. 28,586, Dec. 29, 1903.

SEE Fr. Pat. 337,630 of 1903; this J., 1904, 500.—T. F. B.

Water Purifying Apparatus. P. Schou, Copenhagen. Eng. Pat. 21,777, Oct. 10, 1904.

THE water enters a conical vessel from pipes attached to a central rotating pipe, the rotation being caused by the pressure of water issuing from the pipes. The central rotating column extends upwards into a chamber placed above the conical vessel. This second chamber contains the chemicals to be added to the water, and stirrers attached to the central column serve to keep these well mixed. A cam is placed on the shaft, and, as it rotates, it opens and closes a spring valve in a pipe leading from the chemical chamber to the water tank. The distance which the valve opens is partially regulated by an adjustable disc on the valve-rod, and also by a piston on the main shaft, which rises with an increase of the pressure of the water supply and causes a wider part of the cam to operate on the valve rod.—W. P. S.

UNITED STATES PATENTS.

Garbage or Offal; Apparatus for Cooking —, and Removing the Oil or Grease therefrom. C. S. Wheelwright, Bristol, R.I. U.S. Pat. 774,804, Nov. 15, 1904.

SEE Eng. Pat. 14,482 of 1904; this J., 1904, 879.—T. F. B.

Garbage, &c.; Process of Cooking —, and Removing the Oil, &c., therefrom. C. S. Wheelwright, Bristol, R.I. U.S. Pat. 774,805, Nov. 15, 1904.

SEE Eng. Pat. 14,709 of 1904; this J., 1904, 879.—T. F. B.

Garbage or Offal; Apparatus for Cooking —, and Removing the Oil therefrom. C. S. Wheelwright, Bristol, R.I. U.S. Pat. 774,806, Nov. 15, 1904.

SEE Eng. Pat. 14,483 of 1904; this J., 1904, 879.—T. F. B.

Garbage &c.; Process of Cooking —, and Removing the Oil, &c., therefrom. C. S. Wheelwright, Bristol, R.I. U.S. Pat. 774,807, Nov. 15, 1904.

SEE Eng. Pat. 15,285 of 1904; this J., 1904, 909.—T. F. B.

Garbage or Offal; Apparatus for Removing Oil or Grease from — C. S. Wheelwright, Bristol, R.I. U.S. Pat. 774,808, Nov. 15, 1904.

SEE Eng. Pat. 14,483 of 1904; this J., 1904, 879.—T. F. B.

Water, Purifying Apparatus — J. C. W. Greth, Assignor to W. B. Scaife and Sons Co., Pittsburg, Pa. U.S. Pat. 775,901, Nov. 22, 1904.

A LIME-SATURATING and lime-treatment tank, a "soda"-treatment tank, an upward flow settling tank and a filter are contained in a single outer tank. The water to be treated, passes through the system in the above order. Means are provided for controlling the supply of water and chemicals automatically, and for causing an inverse vertical flow in the lime and "soda" tanks.—W. H. C.

FRENCH PATENT.

Liquids [Water]; Process of Sterilising — L. Freysing and R. Roche. Fr. Pat. 345,148, July 26, 1904.

THE process consists in adding to the liquid, especially water, compounds capable of generating a small quantity

of hydrogen peroxide (about 50 mgrms. per litre of water), and then separating the water by decantation or filtration from the residual reaction products. The compounds added, must be of such a nature that the residual products are insoluble and perfectly innocuous.—A. S.

(C.)—DISINFECTANTS.

Bactericidal and Antiseptic Action of Eucalyptus Oil and its Constituents. C. Hall. Schimmel's Report, Oct. 1904, 87—39.

EUCALYPTOL[CINEOL] is the least active in bactericidal power of all the constituents of eucalyptus oils. Aromadendral, piperitone and phellandrene are the most active bodies. *B. coli communis* is only destroyed after eight hours' exposure to the action of cineol; the same effect is obtained under similar conditions, in 10 minutes with aromadendral, in 40 minutes with piperitone, and in 90 minutes with phellandrene. Dextro- and lævo-pinene and aromadendrene are somewhat less powerful as antiseptics than phellandrene, but are more active than cineol. Eudesmol has a powerful bactericidal action, and also increases the activity of cineol and piperitone. When eucalyptus oil contains ozone, due to the oxidation of the terpenes, the antiseptic power of the contained cineol is enormously increased. Such oils destroy the vitality of *B. coli communis* in 15 minutes, and the activity of the cineol is then only exceeded by that of aromadendral. For this reason only ozonised eucalyptus oils should be employed as the source of cineol intended for medicinal use. It is stated that the ozone is not removed from cineol by the process of extraction by freezing and rectification.—J. O. B.

FRENCH PATENT.

Phenol and Formaldehyde; Process for Preparing a Condensation Product of — [Disinfectant]. A. Stephan. Fr. Pat. 345,398, Aug. 6, 1904.

200 GRMS. of phenol are heated with 400 grms. of a 40 per cent. solution of formaldehyde, in presence of alkali, to about 100° C., using a pressure of 1½ to 2 atmospheres. The resulting liquid is heated on a water-bath under reflux condenser till the odour of phenol has disappeared, and precipitation is then effected by the addition of acid. The precipitate is filtered off and dried, and is suitable for use as a disinfectant. (See also Lingner, this J., 1903, 1014; and Raetz, this J., 1904, 500.)—T. F. B.

XIX.—PAPER, PASTEBOARD, Etc.

Straw Pulp [for Paper-Making] and Cattle Fodder. Lehmann. Papier-Zeit., 1904, 29, 3562.

A PROPOSAL is made for increasing the fodder value of cereal straw by combining the manufacture of straw pulp for paper mills with that of "soda-straw" for cattle fodder. It is suggested that the manufacture might be undertaken by the beet-sugar factories during the season when sugar manufacture is at a standstill. The straw is boiled in spherical boilers of at least 10 cubic metres capacity; in one operation straw cellulose for papermaking is prepared by boiling the straw with caustic soda and separating the fibre in the form of "half-stuff." In the next operation the alkaline liquors, drained off from the pulp and containing at least half of the nutrient matters of the straw, are utilised for boiling a second batch of straw which is to be used as cattle fodder.—J. F. B.

ENGLISH PATENT.

Esparto Grass, Straw, Wood, and the like, Utilisation [Distillation] of Residual Matters containing Alkaline and Organic Substances, such as the Residual Matters resulting from the Treatment of —, in the Preparation of Paper Pulp. E. H. Strauge, J. H. Gaele, and A. A. Longdon. Eng. Pat. 27,732, Dec. 17, 1903. III., page 1207.

UNITED STATES PATENTS.

Fibre for Paper-Making; Apparatus for Preparing —. F. H. Cloudman, Rumford Falls, Me. U.S. Pat. 775,027, Nov. 15, 1904.

A CONDENSER is arranged above, and connected with the upper part of a digester, and an air separating and gas-absorbing arrangement is placed between the condenser and the lower part of the digester. After leaving the condenser, the condensed liquid and absorbed gas return to the digester by the action of gravity through the air-separating means, the latter being provided with an outlet for the discharge of the air.—R. N.

Fibre for Paper-Making; Apparatus for Preparing —. F. H. Cloudman, Westbrook, Me. U.S. Pat. 775,028, Nov. 15, 1904.

A DIGESTER is connected by means of a pipe, provided with a valve, with a gas absorber placed at a higher level. Above the gas absorber, and connected with it, is a condenser provided at the top with an air-relief pipe; the liquid and gas return by the action of gravity through a pipe connecting the lower parts of the absorber and digester, the pipe being provided with a check-valve.—B. N.

Paper Pulp. J. Ferrand, Asnières, France. U.S. Pat. 774,982, Nov. 15, 1904.

SEE Fr. Pat. 327,046 of 1902; this J., 1903, 879.—T. F. B.

Paper Pulp; Production of —. J. Kitsee, Philadelphia. U.S. Pat. 775,829, Nov. 22, 1904.

CRUDE wood or other fibre is immersed in a saline solution containing an alkali base, e.g., sodium chloride. The fibre and solution are placed in the negative compartment of an electrolytic apparatus, and the mixture is subjected to the action of an electric current which produces sufficient caustic alkali to dissolve the non-cellulose matters of the wood.—J. F. B.

Wood-Pulp Mill Effluents; Process of Neutralising —. C. W. Doughty, Augusta, Ga. U.S. Pat. 775,525, Nov. 22, 1904.

THE waste sulphite liquors are passed through a tank fitted with partitions, to give an up-and-down motion, and with agitators. The liquors are there treated with calcium carbonate introduced as a continuous current; after suitable agitation the heavy matters are removed by settling, and the decanted liquid is treated with ammonia.—J. F. B.

Paper-Making Apparatus. R. Binns, South Windham, Conn. U.S. Pat. 775,511, Nov. 22, 1904.

A CYLINDER with a "screened" periphery and closed ends is supported entirely upon a hollow shaft within a tank. Outlet passages are provided, through which the water inside the cylinder passes into the hollow shaft. At one end of the hollow shaft is a tilting discharge outlet, the size of which may be altered, and by means of which the level of water inside the cylinder may be varied relatively to that of the water in the tank surrounding the cylinder.—A. S.

Filter [for Waste from Paper and Cellulose Factories]. O. Mehnert and P. Pape, Assignors to Maschinenfabrik Akt.-Ges., vorm. Wagner and Co., Köthen, Germany. U.S. Pat. 775,475, Nov. 22, 1904.

SEE Eng. Pat. 8061 of 1903; this J., 1904, 557.—T. F. B.

FRENCH PATENTS.

Paper from Maize Stalks, Sugar Cane, and Similar Pithy Stems; Manufacture of —. V. Drewsen. Fr. Pat. 344,692, July 9, 1904.

THE stems are split and chopped into suitable pieces, which are then boiled with caustic soda under pressure. The boiled material is then washed and broken in a "putcher" of special construction, provided with washing surfaces which allow the pith cells to pass through their meshes along with the washing water, leaving the true

fibres of the stems in the engine. The good fibres are converted into paper pulp, whilst the washing waters containing the pith cells are collected in large tanks in which the cellular matter is separated by sedimentation—J. F. B.

Pavements free from Dust; Process for Rendering —. Chem. Werke Mügeln, b. Dresden, G. m. b. H. Fr. Pat. 345,067, July 23, 1904. IX., page 1218.

Celluloid Substitute [Casein Basis]; Transparent and Non-inflammable —. H. M. Proveux. Fr. Pat. 339,081, Oct. 5, 1903.

"CASELITE" may be prepared in two ways—(1) Casein, nitrocellulose, and camphor are mixed with 1 part of glycerin, and a boric acid solution, consisting of 1 part of alcohol, heated to 120° C. and containing 50 per cent. of boric acid; (2) the same mixture with the omission of the nitrocellulose and camphor. The proportion of glycerin may be varied according to the degree of plasticity desired. When nitrocellulose and camphor are employed, these constituents are added immediately before rolling. The milled products are finally hardened by immersion in a bath of formaldehyde.—J. F. B.

Artificial Silk; Twisting and Spinning Apparatus for —. Soc. Franç. de la Viscose. Fr. Pat. 245,274, July 30, 1904. V., page 1212.

Artificial Silk; Regulating Valve for Solutions for Spinning —. Soc. Franç. de la Viscose. Fr. Pat. 345,293, Aug. 1, 1904. V., page 1212.

Artificial Silk; Continuous and Automatic Apparatus for Spinning —. Soc. Franç. de la Viscose. Fr. Pat. 345,320, Aug. 2, 1904. V., page 1212.

Viscose; Jet for Spinning Threads from —. Soc. Franç. de la Viscose. Fr. Pat. 345,342, Aug. 3, 1904. V., page 1212.

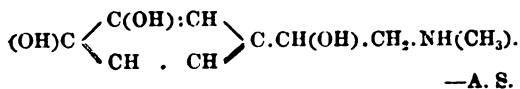
Celluloid Objects and Similar Substances; Process for Imparting a Lustre to —. W. Homberger. Fr. Pat. 345,405, Aug. 6, 1904.

See Eng. Pat. 17,232 of 1904; this J., 1904, 997.—T. F. B.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Adrenaline (Suprarenine). E. Friedmann. Beitr. chem. Physiol. u. Pathol. 6, 92—93, Chem. Centr., 1904, 2, 1512.

THE optically active tribenzenesulpho-adrenaline can be oxidised to a compound containing the same number of carbon atoms as adrenaline, but which is optically inactive, and is of a ketonic character. The author has identified this compound as methylaminacetopyrocatechol, and names it *adrenalone*. On further oxidation it yields a substituted acid amide, $C_6H_5(OH)_2 \cdot CO \cdot OH \cdot NH(CH_3)$, *peradrenalone*. It is concluded that adrenaline has the constitution:



Ephedrine, Synthetic —. E. Fourneau. J. Pharm. Chim., 1904, 20, 481—492.

In addition to ephedrine $C_{10}H_{15}NO$, m. pt. 30° C., isolated by Nagai from *Ephedra vulgaris*, pseudoephedrine $C_{10}H_{15}NO$ m. pt. 114—115° C., discovered by Iadenburg and by Miller in the same plant; and isoeephedrine, obtained by Nagai by heating ephedrine with hydrochloric acid, which was subsequently shown by Schmidt to be identical with pseudoephedrine, the following synthetic amino-alcohols, isomerides and homologues of ephedrine, are described.

Methylaminodimethylphenylcarbinol, $(C_6H_5)_2(C_6H_5)C[CH_2 \cdot NH(CH_3)]OH$, obtained by heating methoethenylphenyl chlorhydrin or iodhydrin with monomethylamine,

under pressure at 130° C. After separating the crystals of methylamine hydrochloride, the mother liquor is concentrated, treated with 20 per cent. hydrochloric acid, and shaken out with benzene to remove neutral bodies and uncombined chlorhydrin; the base is next liberated by sodium carbonate and shaken out with ether. The ethereal residue is then fractionally distilled *in vacuo*. Methylaminodimethylphenylcarbinol is thus obtained as a syrupy non-crystalline base, b. pt. 137° C. under 33 mm. pressure. It affords crystalline salts; hydrochloride, m. pt. 153° C.; aurichloride, m. pt. 148° C.; oxalate, m. pt., 158° C.; the dibenzoyl derivative melts at 123° C.

Dimethylaminodimethylphenylcarbinol, $(C_6H_5)_2(C_6H_5)C[CH_2 \cdot N(CH_3)_2]OH$, also a liquid; b. pt. 135° C. under 23 mm. The hydrochloride melts at 160°, the iodomethylate at 157° C.

Methylaminophenylethylcarbinol, $(C_6H_5) \cdot CH(OH) \cdot CH(C_6H_5) \cdot NHCH_3$, is obtained by treating phenylpropylene with iodine and mercuric oxide in the presence of aqueous ether; by this means an impure iodhydrin is obtained in which the iodine is attached to the carbon of the ethylene chain furthest removed from the benzene nucleus. This crude iodhydrin is allowed to stand in contact for some days with an alcoholic solution of monomethylamine, at normal temperature. The base formed is isolated by fractional distillation *in vacuo*. It boils at 153°—156° C. under 31 mm.; it is a syrupy liquid which separates in large prisms from solution in light petroleum spirit; m. pt., 60° C.; the hydrochloride melts at 178° C., the dibenzoyl derivative at 92° C.

Dimethylaminophenylethylcarbinol, $(C_6H_5)_2C[CH(CH_3) \cdot N(CH_3)_2]OH$, like the preceding base, is an oily liquid crystallising from light petroleum spirit; m. pt., 47° C.; b. pt., 151°—152° C. under 31 mm. The hydrochloride melts at 180° C., the picrate at 80° C., the dibenzoyl derivative at 108° C. The last-named is said to have an intense anæsthetic action.

Methylaminomethylbenzylcarbinol, $(C_6H_5 \cdot CH_2)C[CH_2 \cdot NH(CH_3)]OH$, is obtained from the iodhydrin resulting from the action of nascent hypiodous acid on phenylallylene. It boils at 148° C. under 22 mm. and at 169° under 40 mm. It is very syrupy, remains amorphous at low temperatures, and gives crystalline salts with difficulty. The iodomethylate, precipitated from alcoholic solution by means of ether, and crystallized from acetic ester and ether, melts at 148° C. The dibenzoyl derivative melts at 42°—43° C.

Dimethylaminomethylbenzylcarbinol, $(C_6H_5 \cdot CH_2)C[CH_2 \cdot N(CH_3)_2]OH$, is obtained by substituting dimethylamine for monomethylamine in the preceding experiment. The base boils at 143° C. under 22 mm. The hydrochloride is syrupy; aurichloride, m. pt., 122° C.; the monobenzoyl derivative is liquid; its hydrochloride, which is said to have a powerful anæsthetic action, melts at 165° C.

Primary methylaminomethylbenzylcarbinol, $C_6H_5 \cdot CH(CH_2OH)[CH_2 \cdot NH(CH_3)]$, is obtained from the chlorhydrin, $(C_6H_5)CH(CH_2Cl)(CH_2OH)$, which is produced by the action of epichlorhydrin on phenylmagnesium bromide. It boils at 145° C. under 22 mm. It is heated at 130° C. under pressure, with benzene solution of methylamine. The base thus obtained boils at 145° C. under 24 mm. It is a reducing agent; all its salts are oily.

Dimethylaminomethylbenzylcarbinol.—The base obtained with dimethylamine boils at 136° C. under 24 mm. Its hydrochloride is obtained crystalline by precipitating the solution in acetone with anhydrous ether; m. pt. about 288° C. The aurichloride melts at 126°—137° C., the iodomethylate at 148° C. The hydrochloride of the dibenzoyl derivative forms fine crystals; m. pt., 141° C.—J. O. B.

Skimmianine, an Alkaloid from Skimmia japonica Thunb. J. Honda. Arch. exp. Pathol. u. Pharmac., 1904, 52, 83—94. Chem. Centr., 1904, 2, 1511—1512.

THE alkaloid *skimmianine*, $C_{33}H_{29}N_3O_3$, is present in all parts of the *Skimmia japonica* Thunb., but most abundantly in the leaves. It was isolated by extracting the air-dried leaves with 96 per cent. alcohol at the ordinary temperature. The alcohol was distilled off from the extract, the green residue shaken with warm water, and filtered. The brown filtrate was shaken with chloroform, and after removal of

the chloroform, the base was crystallised from alcohol and obtained in the form of yellowish prisms melting at 175.5°C . The free alkaloid is almost tasteless, but its salts are intensely bitter. The base is easily soluble in chloroform and alcohol, moderately soluble in methyl alcohol, slightly soluble in ether, amyl alcohol, and carbon bisulphide, insoluble in water and light petroleum spirit. Dilute mineral acids dissolve skimmianine only when added in excess; the salts crystallise in needles when the solutions are evaporated. The alkaloid gives voluminous precipitates with the ordinary reagents, such as potassium-mercuric iodide, iodine dissolved in potassium iodide, picric, tannic, and phosphotungstic acids. With Fröhde's reagent it gives a green colour, which changes to blue, and with a solution of potassium permanganate in concentrated sulphuric acid a violet coloration, which changes to yellowish-brown.—A. S.

Essential Oil of Basil. P. van Romburgh and C. J. Euklaar. Report of Konink. Acadam. van Wetenschappen ti Amsterdam, 1904; Schimmel's Report, Oct. 1904, 14.

THE essential oil of *Ocimum basilicum* contains a new terpene, ocimene $\text{C}_{10}\text{H}_{16}$, closely resembling myrcene; like that terpene, it readily absorbs oxygen, being converted into a colourless viscous substance. Ocimene differs from myrcene, however, in physical characters, and on reduction with sodium in alcohol, yields a dihydro-ocimene, which gives a crystalline bromine addition compound differing in sp. gr. from that obtained by Semmler from dihydro-myrcene. Incidentally it is noted that basil oil finds useful application for blending with mignonette bouquets.

—J. O. B.

Citronella Oil; Reliability of Bamber's Test for the Presence of Impurity in —. Schimmel's Report, Oct. 1904, 21.

A SAMPLE of citronella oil, considered to be quite pure, which contained 60 per cent. of total geraniol, and gave a turbid solution which separated no oily drops on cooling, by the "improved Schimmel's test" (this J., 1904, 686) was found when examined by Bamber's method (this J., 1904, 77) to give results indicating the presence of 5 per cent. of impurity. Doubt is therefore expressed as to the reliability for quantitative determinations of Bamber's method, which it is proposed to make the official test for controlling the quality of citronella oil (see Trade Report, p. 1247).

—J. O. B.

Essential Oil of Cypress. Schimmel's Report, Oct. 1904, 23—26.

FURFURAL, *d*-pinene, *d*-camphene, *d*-sylvestrene, cymene; a ketone possibly sabinol; a terpene alcohol (?); *d* terpineol, as ester, probably acetate; valeric acid, *l*-cadinene, a sesquiterpene alcohol; cypress camphor, identical with the sesquiterpene alcohol of cedar oil; and a body with the odour of gum labdanum, are recorded as constituents of cypress oil.—J. O. B.

Essential Oil of Fennel [and Anethol]; Cause of the Increase of Density of —. Schimmel's Report, Oct. 1904, 42.

THE observed increase in the sp. gr. of fennel oil on keeping under certain conditions is due, in part, to the oxidation of anethol into anisic aldehyde and anisic acid, and, in part, to the polymerisation of the anethol. Fennel oil [and anethol] should therefore be stored in vessels from which light and air are excluded. A specimen of anethol which originally had the following characters: sp. gr. at 25°C , 0.9846; $\alpha_D^{20} = \pm 0^{\circ}$; $n_D^{20} = 1.56079$; solidifying point $+21.3^{\circ}\text{C}$; solubility in 90 per cent. alcohol 1:2, after being kept for two years exposed to air and light, acquired the sp. gr. at 25°C of 1.1245; $\alpha_D = \pm 0^{\circ}$; $n_D^{20} = 1.54906$; not solidifying at -20°C ; solubility in 70 per cent. alcohol, 1:1.5. Not only was the sp. gr. greatly increased, but the oil had become much more soluble; it was less mobile than normal anethol, and the taste had entirely changed, becoming disagreeable. It contained

some anisic aldehyde but only traces of anisic acid. The greater part of the original anethol had become polymerised.

—J. O. B.

Essential Oil of Ginger-Grass; Constituents of —. Schimmel's Report, Oct. 1904, 44—48.

DEXTRO-LIMONENE and dipentene have been isolated from ginger-grass oil, also an aldehyde $\text{C}_{10}\text{H}_{16}\text{O}$, isomeric with citral, having an odour resembling that of cinnanthic aldehyde and of citronellal, b. pt. at 5 mm. 76° — 78°C , at 754 mm. 221° — 224°C , sp. gr. at 15°C 0.9551 optically inactive; this aldehyde only occurs to the extent of 0.2 per cent. in the original oil. The alcohol $\text{C}_{10}\text{H}_{18}\text{O}$, resulting from its reduction, was a thick oil, b. pt. at 4 mm. 89° — 91°C ; at 755 mm. 236° — 238°C ; sp. gr. at 15°C 0.9419, optically inactive; m. pt. of phenylurethane, 100° — 101°C . On exposure to air the aldehyde readily oxidises, forming a crystalline acid, $\text{C}_{10}\text{H}_{16}\text{O}_2$, m. pt. 106° — 107°C . It is identical with the acid obtained by saponifying the esters of the oil. In addition to the above, an alcohol, $\text{C}_{10}\text{H}_{16}\text{O}$ is found to accompany the geraniol present.—J. O. B.

Essential Oil of Juniper; Russian, Dextrorotatory —. Schimmel's Report, Oct. 1904, 50.

Two specimens of Russian juniper oil have been met with, which were normal in all physical characters except optical rotation, the α_D being $+7^{\circ}$ and $+8^{\circ}$ instead of showing the usual levogyrate rotation. The aroma of the oils was good, and the solubility normal.—J. O. B.

Lemon-Grass [Essential] Oil from the Cameroons. Schimmel's Report, Oct. 1904, 52.

A SPECIMEN of *Andropogon* grass oil, distilled from plants cultivated in the Botanical Gardens at Victoria, Cameroons, which were believed to be authentic citronella grass, has been found to have all the characters of lemon-grass oil, sp. gr. 0.8929; $\alpha_D = -0^{\circ}8'$; citral content 84 per cent.; imperfectly soluble in 70, 80, 90 per cent., and absolute alcohol. In its insolubility in alcohol the oil resembles West Indian lemon grass oil. Great confusion exists in the botanical nomenclature of the species *Andropogon*; in addition to this, it is possible that conditions of climate, soil, and culture, profoundly modify the character of the oil of the same species grown in different localities. West Indian grass oil, supposed to be derived from *Andropogon schoenanthus*, which should yield palmarosa oil, gave a product more nearly approaching lemon-grass oil. In another instance, the same plant has been found, in one locality, to yield an oil rich in geraniol; in another, a distillate in which citral was the predominant constituent. A further difficulty lies in the fact that distinct species of the genus *Andropogon* are susceptible of great variation, this being especially the case with *Andropogon schoenanthus*. Another source of error is the vernacular names given to the oils. Thus in Java, lemon-grass oil is known as "sireh," but the same name is applied to the oil of *Tetranthera citrata*, belonging to a different natural order, but closely resembling lemon-grass oil in odour.—J. O. B.

Essential Oil of Limes. Schimmel's Report, Oct. 1894, 54.

Two specimens of Dominica lime oil from Barbados have been examined.

Hand-pressed Lime Oil.—Sp. gr. at 15°C , 0.9008; $\alpha_D = +36^{\circ}17'$; α_D of first 10 per cent. on fractionating $= +39^{\circ}30'$; acid value 6.05; ester value 29.55; residue on evaporation 17.8 per cent.; solubility in 90 per cent. alcohol somewhat over 1:4, with slight turbidity due to a paraffin. The dilute alcoholic solution shows a blue fluorescence, probably due to the presence of methyl anthranilate. The oil is yellow, and has a pleasant lemon-like aroma.

Distilled Lime Oil.—The oil was bright yellow in colour, and had an unpleasant empyreumatic odour: sp. gr. 0.8656; $\alpha_D = +46^{\circ}36'$; α_D of first 10 per cent. on fractionating $= +53^{\circ}8'$; acid value 1.8; ester value 4.05; residue on evaporation 3.16 per cent.; solubility in 90 per cent. alcohol, about 1 in 5, with slight cloudiness.—J. O. B.

Essential Oil of Nutmeg. Sp. Gr. of — in the British Pharmacopœia. Schimmel's Report, Oct. 1904, 66.

THE limits of sp. gr. 0.870 to 0.910 at 15.5° C. officially required by the Pharmacopœia are considered to be too low, and instead of ensuring the supply of oil distilled from rich nutmegs, have an opposite tendency. The normal range of sp. gr. is from 0.870 to 0.920; oil distilled from specially fine nutmegs attaining the sp. gr. 0.922.—J. O. B.

Essential Oil of Opopanax. Schimmel's Report, Oct. 1904, 67.

STEAM distillation of the so-called opopanax gum, derived from a *Balsamodendron*, probably *B. kafal*, yields the fragrant oil used in perfumery. A recently prepared specimen had the sp. gr. 0.895, $n_D^{20} = -12^\circ 55'$, saponification value 14.5, which was increased on acetylating. The bulk of the oil distilled under 3 mm. pressure at 45°–130° C. From the residue a small quantity of a sesquiterpene alcohol was separated; b. pt. in *vacuo* 135°–137° C. This had the characteristic odour of the oil. The portion which distilled in *vacuo* consisted chiefly of a sesquiterpene, boiling at ordinary pressure at 260°–270° C. It gave a crystalline hydrochloride, m. pt. 80° C.—J. O. B.

Essential Oil of Phellandrium Aquaticum [Water Fennel]; New Constituents of —. Schimmel's Report, Oct. 1904, 88–92.

A NEW aldehyde, phellandral, $C_{10}H_{16}O$, isomeric with citral, has been isolated from the essential oil of *Phellandrium aquaticum*, after removing phellandrene. Phellandral has the following characters:—B. pt., 89° C. under 5 mm. pressure; sp. gr. at 15° C., 0.9445; $n_D^{20} = -36^\circ 30'$; the semicarbazone, sparingly soluble in alcohol, has the m. pt. 204° C.; the oxime, in large brilliant tablets, melts at 87°–88° C.; the phenylhydrazone, which readily resinifies, melts at 122°–123° C. On exposure to the air, phellandral oxidises, forming a crystalline acid, having the formula $C_{10}H_{14}O_2$. When oxidised with permanganate, a dibasic acid, $C_8H_{10}O_4$, soluble in water and crystallising in needles, is obtained. In the non-aldehydic portion of the oil a new alcohol, androl, $C_{10}H_{20}O$, was isolated by fractionating the lower boiling portions of the oil. This had the b. pt. 197°–188° C.; sp. gr. 0.858; $n_D^{20} = -7^\circ 10'$; $n_D^{20} = 1.44991$. It had, in a high degree, the characteristic odour of the oil, and is probably the chief odorous principle. Another alcohol, with a rose-like odour, was isolated from the fractions boiling above 230° C. by means of phthalic anhydride, but the amount was too small for identification.—J. O. B.

Essential Oil of Cinnamomum Loureirii; Nekkei Oil. Schimmel's Report, Oct. 1904, 96.

THE essential oil of the leaves and young shoots of the Japanese cinnamon, *Cinnamomum loureirii*, distilled in Japan, is bright yellow in colour, and has a pleasant odour resembling that of citral and Ceylon cinnamon oil. The yield is 0.2 per cent. It has the following characters:—Sp. gr. at 15° C. 0.9005; $n_D^{20} = -8^\circ 45'$, acid value, 3.01; ester value, 18.6; solubility in 70 per cent. alcohol 1:2 to 2:5 and more, with opalescence; 1:1 with 80 per cent. alcohol. It contains 27 per cent. of aldehydes, chiefly citral; the non-aldehydic constituents contain cineol and linalool, the latter constituting about 40 per cent. of the original oil.—J. O. B.

Essential Oil of Tanacetum Boreale. Schimmel's Report, Oct. 1904, 97.

THE half-dried herb yielded 0.12 per cent. of a yellowish oil with a powerful thujone odour; sp. gr. at 15° C. 0.9218; $n_D^{20} = +48^\circ 25'$; soluble with turbidity in about 8 volumes of 70 per cent. alcohol, and separating paraffin.—J. O. B.

Thuja Articulata; Essential Oil of the Wood of —. E. Grimal. Comptes rend., 1904, 139, 928–928.

THE wood of this Algerian tree (which furnishes Sandarac resin) when submitted to distillation with steam, yields about 2 per cent. of a dark reddish-brown essential oil, which smells of phenols. It contains carvacrol, thymoquinol, and thymoquinone.—J. T. D.

Essential Oil in Annuals; Formation and Distribution of —. E. Charabot and G. Laloue. Comptes rend., 1904, 139, 928–929.

BEFORE the period of flowering, the essential oil is formed in the green parts of the plants. As the development of the flowers proceeds, the quantity of essential oil in the whole portion of the plant borne by each stalk, increases; but that in the green parts shows a diminution, whilst that in the flowers shows a great increase. The essence thus appears to be transported from the leaves to the flowers, along with the carbohydrates which are destined for the nutrition of the flowers and fruit. After fruiting, when the reserve storage of carbohydrates is accomplished, and the transport of nutritive substances to the flower ceases, the essential oil seems to return to the leaves; for these show an increase, whilst the amount in the flowers, and the total amount in the plant, have decreased. The essential oil thus seems not to be independent of the mechanism which provides for the accumulation of reserve nutriment in the fruit. Comparing different organs of the plant, the leaves and flowers are found to be richest in essential oil; the stalks contain but little, and the roots none.—J. T. D.

Lupeol from the Bark of Roucheria Griffithiana, Planch. J. Sack and B. Tollens. Ber., 1904, 37, 4105–4109.

THE authors have studied the above bark which is employed by the natives of Malacca for mixing with their arrow-poison. They have obtained from it dextrose and a crystalline substance belonging to the cholesterol group, which is identical with the *lupeol* previously observed in lupin-pods and in certain species of gutta-percha. The *lupeol* was extracted from the bark by means of alcohol and was prepared, after repeated purification, in the form of fine colourless needles, melting at 210° C. It is insoluble in water and aqueous acids and alkalis, but soluble in most organic media. *Lupeol* has the formula $C_{30}H_{48}O$ and a rotatory power, in 6.5 per cent solution in chloroform, of $[\alpha]_D^{20} = 27.3^\circ$. When treated with acetic anhydride and strong sulphuric acid, its chloroform solution yields a violet coloration after half an hour. *Lupeol* combines with 3 atoms of bromine by addition; the dibromide melts at 154° C., the benzoate at 262° C., and the phenylcarbamate at 226° C.—J. F. B.

Barium Platinocyanide; Preparation of —. A. Brochet and J. Petit. XI. A., page 1222.

Osmosis, Solubility und Narcosis; Theories of —. I. Traube. XXIV., page 1242.

Chlorine in Essential Oil of Bitter Almonds; Manipulation of the Test for —. Schimmel's Report, XXIII., page 1240.

ENGLISH PATENTS.

Amino-Alcohols and their Derivatives [for Perfumery]; Preparation of —. E. F. A. Fourneau, Paris. Eng. Pat. 24,631, Nov. 12, 1903.

SEE Fr. Pat. 338,889 of 1903; this J., 1904, 910.—T. F. B.

Pyrocatechuicmonoalkylethers and especially of Guaiacol and Guaethol with Protein Substances; Process for the Production of Compounds of —. H. C. Fehrlin, Schaffhausen, Switzerland. Eng. Pat. 449, Jan. 7, 1904.

COMPOUNDS of "pyrocatechuic monoalkyl ethers" with protein substances (e.g., albumin) are prepared either by mixing together aqueous solutions of the substances, with or without heating, until the mixture coagulates, or by adding an aqueous solution of the proteid to an alkaline solution of the "pyrocatechuic ether" and precipitating the solution with dilute acid. The product is filtered, washed, dried, heated to 115°–120° C., washed with some indifferent solvent (e.g., toluene), and finally dried. For example, 650 grms. of guaiacol or guaethol, dissolved in alcohol, are added, with constant stirring, to a solution of 1 kilo. of egg albumin in 10 litres of water; or a mixture of 1 kilo. of casein, 150 grms. of guaiacol, and 2 kilos. of alcohol is heated for several hours on the water-bath. The compounds thus

produced, are insoluble in water, alcohol, and acids, but are decomposed by alkalis; they are also completely insoluble in the gastric juice, and are said to possess therapeutic value.—T. F. B.

UNITED STATES PATENTS.

Ionone; Process of making Homologues of — R. Schmidt, Assignor to Haarmann and Reimer, Chem. Fab. zu Holzminde. G. m. b. H., Germany. U.S. Pat. 775,251, Nov. 15, 1904.

Cyclic homologues of ionone are prepared by treating aliphatic homo-ionones with dilute acid, and treating the "α-cyclic" homo-ionones thus formed with a concentrated acid at a temperature not above 40° C.; the cyclic homo-ionones may also be prepared by treating the aliphatic ketones directly with concentrated acid below 40° C. Different isomers of the ionone derivative are obtained according to the nature of the concentrated acid employed. See also Ger. Pats. 116,637, 122,466, and 134,672, and U.S. Pat. 762,765; this J., 1901, 151 and 1018; 1902, 1348; and 1904, 798.—T. F. B.

Citrus Fruits; Process of Extracting Oleo-Resin from the Peel of — E. J. Sheenan, Assignor to San Gabriel Valley Essential Oil Co., Pasadena, Cal. U.S. Pat. 775,502, Nov. 22, 1904.

The peel of citrus fruits is coarsely ground, wrapped in filter cloth, and the water removed by pressing between plates. The mass is finely pulverised, extracted with a suitable volatile solvent (ether, chloroform, or carbon bisulphide), the extract evaporated, and the oleo-resin dried in a current of hot air.—T. F. B.

Citrus Fruits; Oleo-resinous Product from — E. J. Sheenan, Utica, N.Y., Assignor to San Gabriel Valley Essential Oil Co., Pasadena, Cal. U.S. Pat. 775,546, Nov. 22, 1904.

CLAIM is made for the oleo-resinous product extracted from the peel of citrus fruits by the method described in U.S. Pat. 775,502 (see preceding abstract). This consists, in addition to the essential oil of the fruit, of a series of flavouring resins composed of acid and neutral resins in about equal proportions and together constituting from 6–10 per cent. of the total product. Its specific gravity is slightly higher and its optical rotation slightly lower than those of the commercial essential oils. The neutral resins are not volatile in steam, but are deposited from hot alcohol in the form of crystals of m. pt. 120°–130° C. The acid resins are insoluble in alcohol, but soluble in alcoholic sodium hydroxide solution. These resins are all completely soluble in ether, chloroform, or carbon bisulphide.—T. F. B.

Dialkylbarbituric Acid; Process for Preparing — M. Engelmann, Elberfeld, Germany, Assignor to Farbenfabr. of Elberfeld Co., New York. U.S. Pat. 775,809, Nov. 22, 1904.

The process is similar to that described in Eng. Pat. 22,967 of 1903 (this J., 1904, 76) with the exception that the thiocarbonyl group of the dialkyl-di-imino-thiopyrimidine is first oxidised to a carbonyl group, the two imino groups being subsequently eliminated.—T. F. B.

Dialkylbarbituric Acid; Process of Preparing — M. Engelmann, Elberfeld, Germany, Assignor to Farbenfabr. of Elberfeld Co., New York. U.S. Pat. 775,810, Nov. 22, 1904.

SEE Eng. Pat. 22,967 of 1903; this J., 1904, 76.—T. F. B.

Phenol Compound. C. Gentsch, Vohwinkel, Germany, Assignor to Farbenfabr. of Elberfeld Co., New York. U.S. Pat. 775,814, Nov. 22, 1904.

THE addition compounds, formed by uniting 1 mol. of an alkali salt of a phenol with several molecules of a free phenol, are claimed. Special claim is made for that derived from 1 mol. of the potassium salt of *m*-cresol and 3 mols. of *m*-cresol, which is a crystalline solid having an alkaline reaction; it melts at 88° C., above which temperature *m*-cresol is split off. —T. F. B.

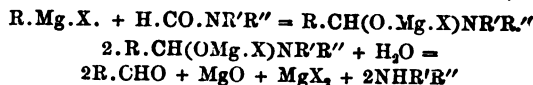
Alcohols and Aldehydes; Process of Making — H. S. Blackmore, Assignor to R. C. Mitchell, Mount Vernon, N.Y. U.S. Pat. 774,824, Nov. 15, 1904.

A MIXTURE of an alcohol and aldehyde is produced by passing the corresponding hydrocarbon over a mass of a suitable metallic oxide (e.g., ferric oxide) heated to a temperature sufficient to oxidise the hydrocarbon, but insufficient to decompose the desired products. Thus, a mixture of methyl alcohol and formaldehyde is obtained by passing a current of methane under pressure over heated ferric oxide. When the process is complete, the reduced iron is re-oxidised by heating it and passing a current of air over it. —T. F. B.

FRENCH PATENTS.

Aldehydes; General Process of Preparing — L. Bouveault. Fr. Pat. 339,121, Oct. 26, 1903.

ALDEHYDES are produced by decomposing with water the product of the reaction of di-substituted aminoformaldehydes on alkyl-, aryl-, or hydroaryl magnesium halides. The stages of the process are represented by the equations—



where R, R', and R'' represent alkyl-, aryl-, or hydroaryl radicles and X a halogen atom.—T. F. B.

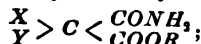
Marc of Wine or Fermented Products; Recovery of Alcohol [and Cream of Tartar] from — G. Ciapetti. Fr. Pat. 344,880, June 18, 1904. XVII., page 1231.

Marc and Grapes, [Alcohol and Cream of Tartar]; Process and Apparatus for Treatment of — Egrot Grangé et Cie. Fr. Pat. 344,737, July 9, 1904. XVII., page 1231.

Alkylaminoacetopyrocatechols; Process for Preparing — Farbwerke vorm. Meister, Lucius und Brüning. First addition, dated July 18, 1904, to Fr. Pat. 344,930, July 18, 1904. Under Internat. Conv., Sept. 26, 1903.

SEE Eng. Pat. 26,430 of 1903; this J., 1904, 1043.—T. F. B.

Dialkylbarbituric Acids from Dialkylaminomalonic Esters



Process for Producing — Maison E. Merck. Fr. Pat. 344,980, July 20, 1904. Under Internat. Conv., March 16, 1904.

DIALKYLBARBITURIC acids, as well as dialkylbarbituric esters and dialkylmalonic acid amides, are produced by the action of urea, thiourea or guanidine on dialkylaminomalonic esters, of the formula (X)(Y)C(CONH₂)COOR, in presence of suitable condensing agents. Diethylbarbituric acid is produced by heating diethylaminomalonic acid with urea and sodium ethylate. Diethylmalonylguanidine is produced similarly from guanidine hydrochloride and diethylaminomalonic ester.—T. F. B.

C.C.-Dialkylbarbituric Acids; Process for the Production of — E. Merck. Fr. Pat. 345,496, July 20, 1904. Under Internat. Conv., Oct. 20, 1903.

DIALKYLALONYLGUANIDINES, R₂C:(CO.NH)₂:C:NH, are converted into dialkylbarbituric acids by heating (e.g. in a sealed tube at 120° C. for an hour), with reagents which will split off the imino group, such as dilute hydrochloric or sulphuric acid (1:3). Compare Fr. Pat. 343,673 of 1904; this J., 1904, 1043.—T. F. B.

Barbituric Acids; Process for Converting Di-imino or Tri-iminobarbituric Acids (Di-iminomalonylguanidines) into — E. Merck. Fr. Pat. 345,497, July 20, 1904. Under Internat. Conv., Feb. 10, 1904.

DI-IMINO and tri-iminobarbituric acids, obtained by condensing malonyl-nitrile or its alkyl derivatives with urea or guanidine, are converted into barbituric acids by heating with mineral acids. (Compare preceding abstract.)

—T. F. B.

Bromodialkylacetamides; Process for Preparing —. Kalls et Cie. Fr. Pat. 345,231, July 29, 1904. Under Internat. Conv., Dec. 9, 1903.

BROMODIALKYLACETAMIDES of the constitution $R.R'.CBr.CONH_2$, are obtained from the corresponding dialkylacetic acid by converting the latter, by the action of phosphorus chloride or phosphorus and bromine into dialkylacetyl chloride or bromide, brominating with one mol. of bromine, and converting the resulting bromodialkylacetyl chloride or bromide into bromodialkyl acetamide by treating with ammonia or ammonium carbonate in ethereal solution. The diethyl, ethylpropyl, and dipropyl compounds are described.—T. F. B.

Picric Acid; Process for Preparing — in the Cold. O. Wichardt. Fr. Pat. 345,441, Aug. 9, 1904.

PICRIC acid may be prepared without the aid of heat, by adding 20 parts of phenol, with constant stirring, to a mixture of 100 parts of nitric acid (sp. gr., 1.4) and 30 parts of alcohol. The crystalline mass thus produced is dissolved in hot water, and the crude picric acid, which separates on cooling, is purified in the usual way. The yields are stated to average 95 per cent. of the phenol used.—T. F. B.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Development with an Acid Developer. Maes. Brit. J. Phot., 1904, 51, 1031–1032.

BALAGNY (Fr. Pat. 338,650 of 1903; this J., 1904, 680) has shown that amidol can be used successfully in acid solution for developing plates and papers: the author finds that other developers, notably pyrogallol, ortol, and adurol, give equally good results in acid solutions. The time necessary for development is greater than when alkaline solutions are employed, but there is less tendency to fog and halation, and better gradation is obtainable.—T. F. B.

Photographs prepared by Lippmann's Process; The Dark Stripes [Zenker's Stripes] which appear on Spectra Covering —. L. Pfaunder. Ann. der Physik, 1904 [3], 15, 371–384. Chem. Centr., 1904, 2, 1446. (See this J., 1891, 483; 1893, 464; 1895, 65; 1896, 400; 1900, 273.)

THE chief result of the author's work, which is mainly mathematical, is that if two light waves of unequal wavelengths penetrate the silver bromide film, the two systems of silver separations are optically influenced. The appearance of the dark stripes predicted by Zenker shows that in the Lippmann process, quite a number of colour-pairs do not unite to a correct colour-mixture, but are neutralised to black.—A. S.

Gelatin; Setting and Swelling of —. P. v. Schroeder. XIV., page 1227.

Colloids [Gelatin, &c.] Solution and Swelling of —. K. Spiro. XIV., page 1227.

ENGLISH PATENTS.

Photographs; Process for Producing Coloured —. W. Riebensahn, Berlin, and G. Koppmann, Hamburg. Eng. Pat. £08, Jan. 12, 1904.

SEE Fr. Pat. 338,170 of 1903; this J., 1904, 622.—T. F. B.

Photography; Films for Use in — [Pigment Process]. C. D. Abel, London, From Act.-Ges. f. Anilinfabr., Berlin. Eng. Pat. 925, Jan. 13, 1904.

SEE Fr. Pat. 339,654 of 1904; this J., 1904, 727.—T. F. B.

FRENCH PATENTS.

Colouring Silver [Photographic] Pictures; Process for —. O. Gros. Fr. Pat. 345,033, May 31, 1904. Under Internat. Conv., April 9, 1904.

"SILVER prints" are first converted into "manganic prints," (see Fr. Pat. 343,583 of 1904; this J., 1904,

1044) and then coloured by means of suitable dyestuffs or solutions. For example, a silver bromide print is decolorised in the following solution: 10 per cent. potassium bromide solution, 3 c.c.; 10 per cent. citric acid solution, 2 c.c.; and 3 c.c. of a solution obtained by mixing 6 grms. of sodium tartrate, 1 grm. of crystallised manganous sulphate, 5 grms. of N/1 sodium carbonate solution, and 5 grms. of a 4 per cent. potassium permanganate solution. To this solution is added 100 c.c. of a 0.4 per cent. solution of potassium ferricyanide. The decolorised print is washed and introduced into a solution composed of 90 c.c. of 2 per cent. potassium ferricyanide solution, and 10 c.c. of sodium carbonate solution. The brown "manganic" print thus obtained can be coloured by any known process, e.g., by means of aniline hydrochloride. By this process it is stated that a much greater variety of tones may be obtained than by working directly on the ordinary silver print.—T. F. B.

Photographic Paper; Sensitive Coating for —, and **Process for Manufacturing same.** G. Hauser. Fr. Pat. 345,206, July 25, 1904.

CERTAIN insoluble zinc salts, particularly the oxide, possess the property of accelerating considerably the reduction of soluble silver salts by daylight. The emulsion may be prepared by immersing the paper or other support, previously coated with gelatin with which zinc oxide has been incorporated, in a solution of silver nitrate or citrate. Prints of a pleasing black tone are said to be obtained on such a paper. They require no further toning, and are finished by simply fixing in sodium thiosulphate solution, which in no way alters the tone. Under-exposed prints may be developed in the usual way, thus permitting the working of these papers by artificial light.—T. F. B.

Photographic Films; Self-Detaching —. M. Bry et Cie. Fr. Pat. 345,535, Aug. 12, 1904.

THE self-detaching films at present in use, consisting of a gelatin film attached to a paper support by means of wax, rubber, glucose, &c., possess the disadvantage of frequently becoming detached during the manipulations, and also of being easily distorted and of curling up, even when dry. These defects are found to be remedied by backing a gelatin film (0.8–1.0 mm. thick) with a film of collodion, applying the sensitive emulsion to the gelatin, and fastening the temporary paper support to the collodion side by means of an albuminoid adhesive, soluble in water. Such a film is stated to retain its shape during the operations, and to be easily detached when finished.—T. F. B.

Pigment [Photographic] Pictures on Transparent Supports; Process for Producing Detachable —. H. Schmidt. Fr. Pat. 345,594, Aug. 13, 1904.

SEE Eng. Pat. 17,610 of 1904; this J., 1904, 998.—T. F. B.

XXII.—EXPLOSIVES, MATCHES, Etc.

ENGLISH PATENTS.

Explosives [Perchlorate]. F. E. W. Bowen, London. Eng. Pat. 21,481, Oct. 6, 1903.

THE composition of these explosives is as follows:—Shell powder: ammonium perchlorate (75 per cent.), aluminium (12 per cent.), and paraffin (13 per cent.). Blasting powder: ammonium perchlorate (72 per cent.), aluminium (11 per cent.), and nitronaphthalene (7 per cent.).

—G. W. McD.

Explosives. F. E. W. Bowen, London. Eng. Pat. 21,482, Oct. 6, 1903.

NITROCELLULOSE (66–75 parts) is dissolved in acetone or ether alcohol and finely powdered ammonium perchlorate (25–33 parts) incorporated with it. The mixture can then be rolled or pressed as usual.—G. W. McD.

Explosives for Blasting or like Purposes. J. Russell, Hamilton, Scotland. Eng. Pat. 28,710, Dec. 31, 1903.

MONO-, di-, or trinitrotoluene (2–10 cent.) is added to nitroglycerin blasting explosives to prevent them from freezing at low temperatures.—G. W. McD.

Explosives; Impts. in — N. Evangelidi, Charcow, Russia. Eng. Pat. 20,106, Sept. 17, 1904.

THE explosive consists of potassium chlorate (78 parts), yellow prussiate of potash (37.5 parts), wood charcoal (6 parts), and glycerin (6.5 parts). The addition of glycerin is said to give safety and to allow of the intimate mixing of the ingredients. For a granulated powder one-half of the charcoal is replaced by tannin.—G. W. McD.

Gunpowder; Manufacture of — Soc. de la Poudre Peigne et des Brevets. J. Luciani, Geneva, Switzerland. Eng. Pat. 21,204, Oct. 3, 1904. Under Internat. Conv., Feb. 17, 1904.

THE charge of powder for ordnance or small fire-arms consists of a sheet of explosive of suitable thickness coiled on itself and provided, either over the whole of its surface, or only a part, with cuts or notches of straight, waved or other shape, which extend wholly or partly through the thickness of the sheet. The object of the invention is to produce a sheet containing a certain number of points at which combustion may commence and from which it may spread in a regular and uniform manner.—G. W. McD.

UNITED STATES PATENT.

Pyrotechnical Compound. K. Hufnagel, Germany, Assignor to E. H. Wagner, New York. U.S. Pat. 775,822, Nov. 22, 1904.

THE compound consists of a mixture of white and red phosphorus, potassium chlorate, red clay, and gum arabic.—A. S.

FRENCH PATENT.

Picric Acid; Process for Preparing — in the Cold. O. Wickardt. Fr. Pat. 345,441, Aug. 9, 1904. XX., page 1238.

XXIII.—ANALYTICAL CHEMISTRY.

APPARATUS, ETC.

Continuous Extraction of Solutions with Chloroform; Apparatus for — E. Baum. Chem.-Zeit., 1904, 28, 1172.

THE apparatus is easily understood from the drawing. Some chloroform is first placed in the inner vessel, followed by the solution to be extracted. Connection is then made to the vessel below containing the chloroform, and to the reflux condenser above, the end of which is so arranged, as seen in the figure, that the drops of condensed chloroform fall through the solution to be extracted.—J. T. D.

FRENCH PATENTS.

Gases; Apparatus [Automatic] for Analysis of — A. Bayer. Fr. Pat. 345,321, July 29, 1904.

THE apparatus is designed for determining and registering graphically the composition of a gaseous mixture, e.g., boiler-furnace gases. It comprises two or more gas meters, communicating with one another, but having interposed between them vessels containing liquid or solid absorbents and tubular cooling devices. The rate of flow of the gas is thus measured before and after the removal of the component to be determined, the gas being brought to the same temperature in each case before passing through the meter. The dials of the meters are connected to a differential registering mechanism, by means of which the rates of flow are traced with a stylus upon a diagram carried by a drum. The gas to be analysed is drawn through the apparatus by means of a water-pump.—H. B.



Wines, Musts, Ciders, &c.; Apparatus for Determining the Dry Extract and the Alcohol in — A. B. Darbois. Fr. Pat. 345,455, July 28, 1904.

THE apparatus consists of an ebullition alcoholometer and a densimeter with immersion tube in a portable case. The ebullition apparatus is heated by a spirit lamp, the flame of which impinges on a metal bulb through which the wine is caused to circulate, whereby rapid heating is ensured. The upper part of the ebullition cylinder is connected with a condenser. The densimeter floats in a cylinder which fits on the same stand as the alcoholometer; it is provided with an index fixed on the top of the cylinder which can be read at a point above the liquid. The stem of the float is graduated in two scales, one showing the dry extract and the other the amount of alcohol obtainable from any fermentable must.—J. F. B.

INORGANIC—QUANTITATIVE.

Iron; Separation of— from Nickel and Cobalt by Formic Acid. L. H. Borgström. Bull. Comm. Geol. de Finlande, 1903, 14, 73; Chem.-Zeit., 1904, 28, Rep. 353.

THE difficulties in the way of the ordinary methods of separation are obviated by using ammonium formate as the precipitant of the iron, the latter alone being thrown down from a neutral solution. A second precipitation suffices to entirely free the iron from nickel and cobalt. The precipitates are easily filtered, but the decomposition, filtration, and washing must be effected in the warm.—C. S.

Copper; Electrolytic Determination of — A. Kufferath. Z. angew. Chem., 1904, 17, 1785—1786.

FOR technical purposes, where the highest degree of accuracy is not required, copper can be determined electrolytically with great rapidity if formaldehyde (in the shape of commercial formalin) be added to the solution. The deposition of nickel, cobalt, and iron is hindered or entirely prevented by the presence of formaldehyde. The solution for electrolysis, about 180 c.c., is placed in a platinum basin of about 9 cm. diameter and 4.5 cm. depth, the inner surface of which has been slightly matted by careful rubbing with finely-powdered glass. To the solution are added 1.5—2.0 c.c. of formalin, the temperature raised to and kept at 60°—65° C., and a current of 2.5—3.0 ampères at 2 volts passed till a sample shows no copper reaction. Without interrupting the current, the deposit is washed clean with water, then twice with 95 per cent. alcohol and lastly with ether; it is then dried *in vacuo* over sulphuric acid. The whole analysis takes 2—2½ hours. The anode is a flat platinum spiral kept as deep as possible in the solution, and passes through an inverted funnel which just touches the liquid; all loss of spray is thus avoided. Results with pure copper sulphate solution were accurate; with mixtures in approximately equal proportions of copper and nickel, copper and cobalt, copper and iron sulphates, 99.71 to 99.92 per cent. of the actual copper was yielded. Ammonium nitrate, chlorides, or free nitric acid, prevent concordant results from being obtained; very small amounts of the last-named, however, may be present without interfering seriously with the process.—J. T. D.

Stannic Oxide in Copper Tin Alloys; Electrolytic Separation and Determination of — E. Heyn and O. Bauer. Mitt. königl. Materialprüfungsamt, 1904, 22, 144—145. (See page 1219.)

THE alloy in the form of turnings is placed on the bottom of a platinum dish and serves as anode, the cathode is of platinum gauze, and the electrolyte sulphuric acid of sp. gr. 1.18. A current strength of 0.5—0.7 ampère is employed. The metallic constituents of the alloy dissolve rapidly, whilst stannic oxide separates at the anode. The copper deposited on the cathode must be frequently removed, to prevent it falling to the bottom and to avoid short-circuiting. Towards the end of the electrolysis the solution of the alloy proceeds very slowly, the separated stannic oxide preventing good electrical contact with the anode. The dish should now be continuously shaken, in

order to expose fresh surfaces of the alloy. The residual stannic oxide is washed with sulphuric acid, treated for a short time with nitric acid, dried, and ignited. It contains a trace of copper, a sample analysed giving the following results:—Stannic oxide, 99.16; copper, 0.99 per cent.

—A. S.

Phosphates; Colorimetric Determination of — O. Schreiner and B. E. Brown. *J. Amer. Chem. Soc.*, 1904, 26, 1463—1468. (See also this J., 1904, 911.)

Besides the solutions (1), (2), (3), and (4), given in the paper of Schreiner and Ferris on the determination of magnesium, the following are required: (6) 1 part of strong ammonia solution (sp. gr. 0.9) free from silica, and 9 parts of water; silica may be removed by distillation; (7) saturated ammonium oxalate solution; (8) magnesia reagent, prepared by dissolving 13 grms. of magnesium chloride, $MgCl_2 \cdot 6H_2O$, and 20 grms. of ammonium chloride in about 900 c.c. of water, adding 50 c.c. of strong ammonia solution (sp. gr. 0.9) and diluting to a litre; 1 c.c. of this solution will precipitate 0.0035 gm. of phosphoric anhydride. To a convenient quantity of the liquid, usually 50 c.c., 1 drop of ammonia solution and two or three drops of saturated ammonium oxalate solution are added and the liquid evaporated to dryness on a water-bath. 1 c.c. of the magnesia reagent (7) is well mixed with the cooled residue, and the whole allowed to stand about two hours. The precipitated magnesium ammonium phosphate is then washed on a filter free from silica several times with the ammonia solution (6) until the filtrate measures approximately 50 c.c. The precipitate is then washed with about 5 c.c. of cold water, dissolved on the filter in about 5 c.c. of nitric acid (2) and the filter is washed with hot water until about 45 c.c. of filtrate are obtained. 4 c.c. of ammonium molybdate solution (1) are added to the cooled liquid and, after 20 minutes, the solution is compared with the standard colorimetric phosphate solution (4). This method gives good results with quantities of phosphates as small as 1 part of phosphoric anhydride per million of solution, and it is not influenced by the presence of other salts, including silicates.

—T. H. P.

ORGANIC—QUALITATIVE.

Sugars; Reaction of Aldehydic — A. Berg. *Bull. Soc. Chim.*, 1904, 31, 1216—1217.

This method is based on the fact that the aldoses are oxidised by bromine in presence of water, the aldehydic group being converted into a carboxylic group. These alcohol acids all give a deep yellow coloration with an acidified solution of ferric chloride. Under similar conditions, ketoses are not converted into carboxylic acids, and the resulting solutions give no coloration with ferric chloride. 0.02—0.03 gm. of the sugar is heated with 10 c.c. of saturated bromine water to 60°—70° C. for 10 minutes, and the excess of bromine removed by boiling. On adding to this solution 10 c.c. of a solution made by the addition of 4 drops of ferric chloride solution (sp. gr. 1.44) and 2 drops of concentrated hydrochloric acid to 100 c.c. of water, the yellow coloration is produced if an aldehydic sugar has been used. This method gives a simple means for establishing the purity of the ketoses. In testing the poly-oses, it is necessary to use freshly prepared bromine water, since hydrobromic acid would tend to cause inversion of the sugar.—T. F. B.

Starch-containing Materials; Method of Distinguishing between Different — by Means of Iodine Vapour. A. Dubosc. *Chem.-Zeit.*, 1904, 28, 1149.

This method, first described by Bleicher, consists in placing the substance on a glass plate, on which is also placed a watch glass containing a little iodine, and covering the whole with a bell-jar. After 24 hours, marked differences can be observed in the colorations of different substances. Thus, maize starch turns blackish-violet, wheat starch bluish-grey, sago starch brownish-grey, and potato-starch yellowish-grey, the yellow shade increasing with the proportion of foreign matters present.—C. A. M.

Essential Oil of Bitter Almonds; Manipulation of the Test for Chlorine in — Schimmel's Report, Oct. 1904, 7—8.

A piece of filter paper about $2 \times 2\frac{1}{2}$ ins. is folded into a spill, saturated with the oil, placed in a small porcelain dish, ignited, and covered over while burning with a capacious beaker, the inside of which has been previously moistened with distilled water. This beaker is allowed to remain for a minute after the flame has burnt out; it is then rinsed with 10 c.c. of distilled water, and the rinsings tested for chlorine in the usual manner, with silver nitrate. Precaution should be taken to ensure that any reaction obtained is not due to hydrocyanic acid.—J. O. B.

ORGANIC—QUANTITATIVE.

Nitrogen in Organic Compounds; Determination of — H. C. Sherman and M. J. Falk. *J. Amer. Chem. Soc.*, 1904, 26, 1469—1474.

DYER'S modification (this J., 1895, 604) of the Gunning-Kjeldahl method of nitrogen determination, in which the substance is heated with sulphuric acid and mercury until frothing subsides, after which 10 grms. of potassium sulphate are added, and the solution boiled until colourless, combines all the advantages of the other modifications of this method. It is, however, not sufficient in all cases to boil the liquid until it becomes colourless. With very resistant substances, such as alkaloids, coal, &c., the boiling with sulphuric acid, mercury, and potassium sulphate should be continued for at least two hours after the solution becomes colourless, and for not less than three hours in all. No advantage is found in the use of copper in addition to the reagents mentioned, but with the coals tested, slightly higher results were obtained by the careful use of permanganate at the end of three hours' boiling. With all samples in which the nitrogen exists essentially as proteids or albuminoids and related compounds, including the so-called "nitrogenous extractives," and other amides and amino-compounds, it is only necessary to use mercury and potassium sulphate and to boil for at least one hour from the time the potassium sulphate is added.—T. H. P.

Ammonia and Amines; Determination of — J. Effront. *Ber.*, 1904, 37, 4290—4295.

WHILE the measurement of the nitrogen evolved by the reaction of hypochlorites upon ammonia and amino-compounds does not afford a generally applicable and accurate method for the determination of these substances, much better results are obtained by measurement of the available chlorine destroyed in the reaction. Amino-, imino-, and nitrile bases, amides and amino-acids can be thus determined, but ammonium-bases are without action on hypochlorites. To carry out the process, 20 c.c. of a solution of bleaching-powder (1.5—2 per cent. of available chlorine) are placed in a 50 c.c. flask, 20 c.c. of N/sodium carbonate solution are added, and 1—5 c.c. of a 1 per cent. solution of the substance under examination; the flask is filled up with distilled water, corked, and allowed to stand in the dark for 12—15 hours. The liquid is then rinsed into a beaker, arsenious oxide solution exactly equivalent to the original bleaching powder solution used, is added, then 20 c.c. of N-sulphuric acid, followed by 10 c.c. of saturated solution of sodium bicarbonate; the excess of arsenious oxide is now titrated by means of iodine solution. The method is available for the determination of ammonia in waters. (See this J., 1904, 912.)—J. T. D.

Naphthalene in Coal Gas and Tar; Determination of — A. H. White and S. Ball. *J. Gas Lighting*, 1904, 88, 262—263, 323—326.

THE authors determined the amount of naphthalene in the gas as it leaves the retort, and followed step by step the progress of its elimination in the subsequent manufacturing plant. For the determination of naphthalene in the purified gas, Küster's method (*Ber.*, 1894, 27, 1101), as modified by Colman and Smith (this J., 1900, 128), was found to give good results. To determine naphthalene in tar, the following method was finally adopted:—About 1 gm. of tar is weighed into an Erlenmeyer flask of 50 c.c. capacity,

closed by a doubly bored stopper containing two tubes, one of which forms an air inlet, whilst the other is attached to a U-tube, the first two-thirds of which is filled with fragments of quicklime, and the remainder with glass-wool and phosphorus pentoxide. The flask and drying-tube are placed in an air-bath heated to 70° – 80° C., the outlet of the latter being coupled by a short connection to a second U-tube outside the air-bath and immersed in ice-cold water. A current of air is drawn through the apparatus at the rate of 2 litres per hour, the naphthalene being volatilised and retained in the cold U-tube. The operation is continued until the latter no longer gains in weight, and the final increase of weight is taken as the quantity of the naphthalene in the tar; although the naphthalene formed is not quite pure, the results are sufficiently accurate for the purpose in view. To determine the amount of naphthalene in the crude gas, in which it is present partly in solution in the suspended tar, and partly in the form of vapour, a half-inch glass tube packed with glass wool is inserted some six inches into the gas main at the point where the test is to be made, the filtering material being thus kept at the same temperature as the gas. One cubic foot is aspirated through the filter, and thence, through as short a connection as possible, into a bottle containing picric acid solution, which retains the naphthalene present as vapour. The naphthalene in the tar filter is estimated in the manner above described, and the picric acid solution is washed into a 50 c.c. Erlenmeyer flask, solid caustic soda added to neutralise the acid, and the naphthalene volatilised and determined as before. The combined result gives a sufficiently accurate representation of the total quantity of naphthalene, both in the suspended tar and as vapour in the crude gas, but does not permit of the estimation of the proportions present in each state, inasmuch as the tar filter, although maintained at the same temperature as the gas, largely absorbs the naphthalene vapour before it reaches the picric acid. It has frequently been stated that the vapour pressure of naphthalene is affected by the presence of moisture, ammonia, and acetylene in the gas, but the authors find, on experimental investigation of this point, that these gases exert no such influence. Experiments made with benzene vapour seemed to indicate that this hydrocarbon increased the vapour pressure of naphthalene, but the authors do not regard the results as conclusive.

—H. G. C.

Beetroots; Direct Determination of Sugar in. *Non-influence of Air on the Results.* H. and L. Pellet. *Bull. Assoc. Chim. Sucr. et Dist.*, 1904, 22, 312–317.

In reply to Loga, who found that in the hot aqueous digestion method of Pellet it was necessary for accuracy to remove the air by subjecting the liquids examined to a vacuum for 30 to 40 minutes, the author attributes his failures to improperly formed pulp. The coarse pulp obtained with rasps having saw teeth give very little emulsion, and the froth is readily removed with a little ether or alcohol. The Keil disc should not revolve at a greater rate than 250 turns per minute, and the normal weight of pulp should be made to 200 c.c. and read in a 400 mm. tube. There is then no difficulty in removing the air.—L. J. de W.

Beetroot Juice; Determination of the Purity of. H. Schulz. *Z. Ver. Deutsch. Zucker Ind.*, 1904, 54 [Techn. Part], 1248–1250.

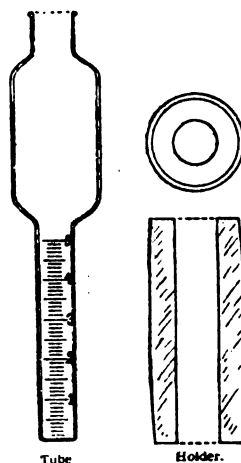
RECENT researches have shown that the usual method of determining the quotient of purity of raw beetroot juice is very unsatisfactory. In the first place it is desirable to be

able to prepare readily in the laboratory a juice which shall represent in composition the factory juice in its various conditions, for it is of far greater importance to know the purity of such juice than that of raw juice which, as is well known, is purified in very different degrees during separation, owing to the varying precipitability of its non-sugars.

The author treated the normal weight of fine rasped pulp in a 200 c.c. flask, half filled with water, with 2 or 3 c.c. of a 1:10 milk of lime, and heated on the water bath to 85° – 90° C. In two minutes the separation was complete. Precipitation of the excess of lime by the ordinary reagents was found to be unsatisfactory. "Active" magnesium carbonate (magnesium bicarbonate) precipitates the lime quantitatively, but the reagent quickly loses its power, when a mixture of magnesium hydroxide and carbonate remains in solution. The active reagent is prepared by completely saturating magnesium hydroxide held in suspension in water with carbon dioxide. The filtrate is cooled at the temperature of melting ice and the magnesium salt crystallised out. It may also be prepared by gradual evaporation at 20° C., but the yield is less and the product not so active.—L. J. de W.

Maple-Syrup and Maple Sugar; Composition, Analysis, and Adulteration of. J. Hortvet. *J. Amer. Chem. Soc.*, 1904, 26, 1523–1545.

THE author describes the methods he has employed in the analysis of a number of samples of maple-syrup and maple-sugar, both pure and adulterated. One of the determinations which gives a clue to the purity or otherwise of the product is that of the volume of the precipitate formed with lead sub-acetate; the method of measuring this is as follows: Into the tube shown in the figure, which has a



a total length of 15.2 cm., a diameter at the wide part of 3.0 cm., and at the stem of 2.0 cm., are placed 5 c.c. of the syrup or 5 grms. of the sugar and 10 c.c. of water. After complete solution, 0.5 c.c. (10 drops) of alumina-cream and 1.5 c.c. of lead sub-acetate solution are added, and the tube well shaken. The tube is then allowed to stand for from 45 to 60 minutes, with occasional twisting to facilitate the settling of the precipitate. It is then fitted into the holder, which is 7.7 cm. long, 3.2–3.5 cm. in diameter, and has a central aperture 1.3 cm. in diameter, and placed in a centrifugal machine and run for six minutes; any material adherent to the wider portion

is then loosened with a piece of wire and the centrifugalising continued for a further period of six minutes at the same speed as before. The volume occupied by the precipitate is then noted, reading to 0.01 c.c. as nearly as possible. A similar blank experiment is made with water, alumina-cream, and lead sub-acetate, the volume of the precipitate obtained being subtracted from those given by the sugars.

The analytical results obtained with sugars and syrups of known purity are summarised in the following table:—

	Syrups.			Sugars.		
	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.
Volume of lead sub-acetate precipitate in c.c.	2.89	1.38	1.87	3.35	1.31	1.99
Ash, per cent.	1.53	0.76	1.02	1.45	0.72	0.99
Phenolphthalein alkalinity	0.62	0.30	0.40	0.57	0.25	0.41
Total alkalinity	2.18	1.09	1.69	2.39	1.12	1.69

These numbers all refer to the amount of dry matter present in the samples.—T. H. P.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Helium; Presence of — in Radio-Active Gaseous Mixtures evolved from Thermal Springs. C. Mouren. Comptes rend., 1904, 139, 852—855.

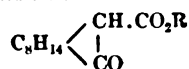
In view of the production of helium from the radium emanation, discovered by Ramsay and Soddy, and since observed by other investigators, it seemed desirable to ascertain whether this element accompanied the radio-active constituents of the gases from mineral springs. Curie and Laborde have already recognised it in three instances, and the author has found the helium line in the spectrum of the gases from 12 other springs which he has examined. In nearly all of them the helium line ($\lambda = 587.6$) was at least as brilliant as the strongest argon lines in the same spectrum. The amounts of helium present vary greatly, that in the strongest springs being estimated at 50 times that in the weakest.—J. T. D.

Colloidal State; The —. G. E. Malfitano. Comptes rend., 1904, 139, 920—922.

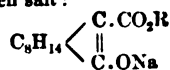
The author considers that matter in the colloidal state consists of an electrolyte dissociated into ions, with insoluble molecules grouped around these ions.—J. T. D.

Salt Formation in Solutions, especially of Tautomerisable Compounds (Pseudo Acids, Pseudo Bases). J. W. Brühl and H. Schröder. Z. physik. Chem., 1904, 50, 1—42.

The authors have determined by physico-chemical methods the chemical constitution of esters and ester-salts of the type of aceto-acetic ester and sodium aceto-acetic ester. The experiments were carried out with the methyl, ethyl-, and amyl esters of camphocarboxylic acid, these compounds being converted into their sodium salts by treatment with the corresponding sodium alcoholates. Three spectro-chemical methods were employed, each giving results controlling and confirming those obtained by the other two. Details are given showing how it can be ascertained by determinations of the refraction and dispersion of the different components and of the mixtures (or solutions of the ester salts):—(1) Whether, in the process of salt formation, the optical properties of the acid radical alter, and, consequently, whether a chemical transformation (enolisation, ketonisation) takes place; (2) whether the optical properties of the basic radical (metal or ammonium) alter; or (3) whether the difference between the optical functions of the salt and of the acid (or base) is a constant, as in the case when the salt formation takes place without chemical transformation, or is smaller or greater than this constant. These methods are applicable to all compounds capable of undergoing tautomerisation (pseudo acids, pseudo bases, and amphoteric compounds). In the case of camphocarboxylic acid esters (which behave as weak acids), it was found that in methyl, ethyl, and amyl alcoholic solutions the formation of ester salts is always associated with a transformation of the ketonic ester:

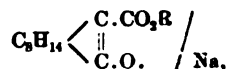


into the enolic oxygen salt:

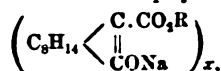


In dilute methyl- and ethyl-alcoholic solutions of the ester salts, the optical function (atomic refraction) of the sodium is practically the same, but is quite different from (about 20 per cent. smaller) than that of the metal in amyl alcoholic solutions of equal dilution. The optical function of the sodium is greater in concentrated than in dilute solutions, and is then the same for all three solvents. These differences are due to the facts that in dilute methyl- and ethyl-alcoholic solutions, the ester salts are ionised, whereas in concentrated methyl- and ethyl alcohols, and in

amyl alcoholic solutions, they are not. Determinations of the osmotic pressure and electric conductivity of the solutions confirmed this view. It was found, in fact, that the sodium salt of camphocarboxylic acid methyl ester is almost completely ionised in dilute methyl alcoholic solution. Solutions of sodium alcoholates in the corresponding alcohols also exhibited a similar behaviour, and it is concluded that the degree of ionisation corresponds to the optical function of the sodium. The optical function can thus be used as an exact expression and measure of the condition of ionisation. Determinations of the optical function of sodium in dilute (ionised) and in concentrated (non-ionised) aqueous solutions of sodium hydroxide showed that this is about 12—15 per cent. smaller in the case of the sodium ion than in that of the non-ionised metal. It would, therefore, be possible to determine spectro-chemically the degree of ionisation of a dissolved compound. The difference in behaviour of solutions of sodium salts of camphocarboxylic acid esters in methyl- or ethyl-alcohol on the one hand, and in benzene or ether on the other hand, is due to the fact that the first-named solutions contain the monomolecular and ionised salt—



whilst the last-named contain the polymolecular salt—



x being equal to from 3 to 4.—A. S.

Osmosis, Solubility, and Narcosis; Theories of —. I. Traube. Phil. Mag., 1904, 8, 704—715.

As the result of experiments on a large number of substances, it is found that the greater the osmotic velocity of a substance soluble in water, the more that substance reduces the capillary constant of water. Substances that cannot penetrate membranes increase that constant. It has also been shown that, in every substance examined by Overton and the author, osmotic and capillary phenomena correspond. Whence it is deduced that the difference of surface tensions determines the direction and velocity of osmosis, in fact it is the motive force in osmotic pressure. From this conclusion it would appear that the generally accepted theory of diffusion is incorrect, and that in reality it is the pure solvent which, by virtue of its low surface tension, migrates into the salt solution. Further, if two mutually soluble liquids, or a solid and a solvent be brought into contact, the "solution tension" will depend chiefly on the difference between the surface tensions. This explains why a much greater quantity of ethyl or amyl alcohol dissolves in water than of water in ethyl or amyl alcohol, and why a coarse and a fine powder behave differently towards solvents (Hulet, Z. Phys. Chem., 1901, 385). Also the surface tension of a solution will never fall below that of the dissolving substance, for, with increasing concentration of the solution, a point will finally be reached when the surface tensions of solution and dissolving substance are equal; at this point the solution will be saturated. This theory is verified by several experiments, e.g., with solutions of ethyl and amyl alcohol in water. It has also been experimentally established that equal equivalents of substances belonging to homologous series (e.g., alcohols, fatty acids, esters), which exercise a strong influence on capillarity, lower the capillary height of water in the proportion 1:3:3²:... The solution tensions of these substances would therefore show a similarly proportional increase with increasing molecular weight. It is then deduced that distribution coefficients and solution tensions—hence also surface tensions and osmotic velocity—are proportional magnitudes of the first approximation; this is also independently established from experimental data. Overton and H. Meyer have found that efficacious narcotics, anaesthetics, and antipyretics all penetrate thin membranes rapidly; but since a near relation exists between osmotic velocity and surface tension, it was to be expected that surface tension and narcotic power would run parallel. This is actually the case, even in substances differing

materially in constitution. In narcotics belonging to homologous series the analogy is complete, since it is found that the narcotic action of homologous substances increases with increasing molecular weight in the ratio $1:8:3^2$ Since narcotics exercise their chief action in cells containing much lipid substance, it follows that, after penetration into the cell, not only will some narcotic be dissolved in the lipid substance, but some of the lipid will dissolve in the narcotic, which is probably the cause of the disagreeable secondary effects exerted more or less by all narcotics. If this be the case, there would seem little probability of ever finding a perfectly innocuous narcotic.—T. F. B.

Aromatic Ketones; Hydrogenation of — by Reduced Nickel. New Synthesis of Aromatic Hydrocarbons. G. Darzens. Comptes rend., 1904, 139, 868—870.

WHEN aromatic ketones are hydrogenated at 190° — 195° C. with the catalytic aid of nickel reduced from nickelous oxide at (not below) 300° C., the reaction $C_6H_5.CO.R + 2H_2 = C_6H_5.CH_2.R + H_2O$ occurs sharply. In this way acetophenone yields (95 per cent.) pure ethylbenzene; *p*-cresyl ketone gives with ease a similar yield of *p*-methyl-ethylbenzene; and *p*-butylacetophenone (easily prepared by treating tertiary butylbenzene with acetyl chloride and aluminium chloride) gives *p*-tertiary butylethylbenzene, a new hydrocarbon, faintly smelling of carrots, b. pt. 209° — 213° C. The same method applied to benzene-substituted fatty ketones is equally fertile, benzoylacetone, for example, yielding normal butylbenzene. While Friedel and Crafts' reaction yields chiefly *m*-derivatives, this method is most applicable to *p*-derivatives. The author finds that the temperature at which the nickel is reduced not only affects the energy of the reaction, but in some cases also its nature; thus nickel reduced at a much lower temperature than 300° C. yields from the ketone not the aromatic hydrocarbon, but its hexahydro derivative.—J. T. D.

Trehalase; Presence of — in Mushrooms. E. Bourquelot and H. Hérissé. Comptes rend., 1904, 139, 874—876.

IN most species of mushrooms trehalase exists. The period of its presence and that of its disappearance seem to be in relation respectively with that during which trehalose is utilised by the plant, and that during which it is being stored as a reserve substance.—J. T. D.

Tyrosine in Elder Berries; Occurrence of —. J. Sack and B. Tollens. Ber., 1904, 37, 4115.

FRESH elder berries were boiled with water, and the extracted juice was clarified by means of lead acetate. The filtrate was then freed from lead, and concentrated. After cooling, crystals separated out, and were fully identified as those of tyrosine.—J. F. B.

Technical Chemistry; The Relations of — to the other Sciences. Address by Prof. C. E. Munroe, of the George Washington University, before the Int. Congress of Arts and Sciences, St. Louis, Sept. 23, 1904. Applied Chemistry Section.

NUMEROUS instances are detailed in this paper of the bearings which technical chemistry has upon other sciences and on the arts, and also of the many ways in which it depends upon other sciences for its progress. Thus, physical processes form an important part of most chemical manufactures; further, technical chemists utilise many physical methods in their analytical work—e.g., spectrum analysis, photometry, polarimetry, &c. It is shown how necessary are research laboratories, both for introducing and examining new products and processes, and for devising and improving analytical methods. The bearing of atomic weight determinations on the purely commercial side of technical chemistry is pointed out. In many instances technical chemistry has benefited greatly by the practical application of theories, such as those of dissociation, mass action, and osmotic pressure. In the course of the paper the following statistics are given of the growth of chemical industry in the United States from 1890—1900:—

Year.	Number of Establishments.	Number of Employés.	Total Wages.	Cost of Materials used.	Value of Products.
1890	58,195	710,485	Dols. 311,869,495	Dols. 2,177,443,777	Dols. 3,165,768,188
1900	84,172	1,039,543	409,848,022	3,892,211,974	4,962,715,787

The United States is the only country which takes a census of manufactures, so no comparisons could be obtained.—T. F. B.

Technical Chemistry; Some Present Problems in —. Address by Prof. W. H. Walker, of the Mass. Inst. of Technology, before The Internat. Congress of Arts and Sciences, St. Louis, Sept. 1904.

IN the author's opinion the point upon which most stress should be laid is that there is no dividing line between pure science and the utilitarian side of chemistry. The explanation of Germany's success in solving the problems confronting chemical industries rests mainly on the fact that in that country it is recognised that the questions have first to be regarded as problems in pure chemistry, to be studied by men fully trained in pure science. If these men are also chemical engineers, then obviously the ultimate solution of the technical problem is hastened, but in the first place the main desideratum is that the men have been trained in the spirit and methods of scientific research. The author reviews some of the important problems in technical chemistry: (1) The production of fertilisers in the United States has increased from 1,900,000 tons to 2,900,000 tons in the past 10 years. It is estimated that the total value of the potash, phosphoric acid, and nitrogen consumed by agricultural products in one year amounts to 3,200,000,000 dols. Of these three ingredients of fertilisers, the supply of phosphoric acid in the form of native phosphate deposits, and of slags from metallurgical processes, seems practically inexhaustible. The supply of potash, on the other hand, will not be on a perfectly satisfactory basis until sources independent of the Stassfurt deposits are discovered. In this direction Clark's method of converting the potassium of felspar into potassium chloride by fusing the mineral with ammonium chloride is of interest; and if the reaction could be applied to orthoclase, and the ammonia recovered economically, an important new source of potash would be available. Most importance, however, attaches to the supply of available nitrogen, and, after a survey of the progress made, the author predicts that it will not be a great while before the synthetic preparation of cyanides, ammonia, and nitric acid from atmospheric nitrogen will be on a commercial basis. At the present time the fixation of atmospheric nitrogen as nitrate through the agency of bacteria rather than by an electrical process appears to be more promising; in fact, cultures for the artificial inoculation of the soil may now be obtained in considerable quantity, and field experiments have shown that with their aid, good crops may be grown upon what would otherwise be almost sterile soil. Another problem connected with technical chemistry, and which is rendered more acute by the possible use of cellulose as a raw material for the production of foodstuffs, is (2) the conservation of forests. The solution of the problem will consist in the substitution of other raw materials in chemical industries where wood is now used for the purpose. As raw materials for the production of cellulose, there are the waste straw of flax, wheat, oat- and other crops, cornstalks, and bagasse from sugar manufacture. (3) In countries where the tax on fermented mash is not high, there would seem to be an opening for a process for the manufacture from alcohol of acetic acid in a more concentrated form than can be produced with the aid of *Mycoderma aceti*, the crude molasses which is wasted in large quantities in semi-tropical countries being used as raw material for the production of the alcohol. Formic acid, also, which can be synthesised from carbon and water, might be substituted for acetic acid for many purposes. Other problems calling for solution are:—(4) methods of tanning with materials other than vegetable

tannins; (5) the synthesis of india-rubber, or substances with similar properties; the utilisation of trade wastes, such as (6) soda and sulphite cellulose lyes, *e.g.*, as foodstuffs for cattle, &c.; (7) waste yeast; (8) arsenic sulphide from the purification of crude acids; (9) grease from wool washing, city garbage, &c.; (10) the hygienic preservation of food; (11) the fireproofing and preservation of wood; and (12) the prevention of the corrosion of structural iron and steel. The author also discusses the applications of electrical energy and of catalysis or contact action, forces the usefulness of which technical chemists are only beginning to appreciate.—A. S.

New Books.

CHEMIKER-KALENDER, 1905. Ein Hilfsbuch für Chemiker, Physiker, Mineralogen, Industrielle, Pharmazeuten, Hüttenmänner u.s.w. Von Dr. RUDOLF BIEDERMANN. Sechszundzwanzigster Jahrgang. In zwei Theilen. *Erster Theil.* Julius Springer's Verlag, Monbijouplatz 3, Berlin. 1905. Price 4s.

ARRANGED as a pocket book and containing almanack for 1905, with also a table of the more frequently used atomic weights and their multiples. In the Thermochemical Tables those numbers are repeated which Berthelot used. Dr. H. Bernthsen and Dr. P. Julius have contributed material improvements in the chapter on Colour Chemistry. The Tables on the Naphthalene derivatives and the Coal-Tar Colours have been thoroughly revised, and Dr. L. Spiegel has revised the Alkaloid Tables. There is a Chronological Table of the principal events in the History of Physical Sciences. A Note-book Calendar with blank pages is further arranged for the different days of the year, in which observations, facts, &c., may be recorded. Then follows a tabulated matter, useful in the Laboratory: of Specific Gravities, of Gases and Liquids, Salts, Alcohols, Tables of Solubility and Properties of Chemical Substances, Analysis, Volumetric Analysis, Gas Analysis, and Spectrum Analysis. The subject-matter, exclusive of the Calendar and the blank pages for Notes, fills 362 pages.

Zweiter Theil.—This supplementary work is of similar size to the pocket-book, but is unbound, and is more directly of Technological interest. It contains Tables relating to I. Physics and Physical Chemistry. II. Mineralogy, and III. Technical Chemical Analysis and Investigations. But, besides the tabulated matter, there are concise descriptive paragraphs of introductory character, with descriptions of Analytical Methods. The subdivisions under III. are as follows:—1. Water. 2. Assaying. 3. Fuels. 4. Sulphuric Acid. 5. Alkali. 6. Bleaching Powder. 7. Saltpetre and Explosives. 8. Ceramics. 9. Glass. 10. Mortar and Cement. 11. Illuminants. 12. Starch and Sugar. 13. Fermentation Industry. 14. Fats and Oils. 15. Tanning. 16. Textile Fibres and Paper. 17. Photography. 18. Dyeing. 19. Physiological Chemical Analysis. Appendix with various Recipes, &c. The subject-matter fills 514 pages.

THE CENTURY IN PHOSPHATES AND FERTILIZERS. A Sketch of the South Carolina Phosphate Industry. By PHILIP E. CHAZAL. Lucas-Richardson Lithograph and Printing Co., 130, East Bay Street, Charleston, S.C. 1904.

8vo pamphlet containing 71 pages of subject-matter.

NOTES ON ASSAYING AND METALLURGICAL LABORATORY EXPERIMENTS. By RICHARD W. LODGE, Assistant Professor of Mining and Metallurgy, Massachusetts Institute of Technology. First Edition. John Wiley and Sons, New York. U.S.A. Messrs. Chapman and Hall, Ltd., London. 1904. Price 12s. 6d.

8vo volume containing 279 pages of subject-matter, with 47 illustrations, and the alphabetical index. The subjects

treated of are as follows:—I. Apparatus, Reagents, and Materials. II. Sampling. III. Assay of Ores for Silver. IV. For Gold. V. For Lead. VI. Bullion. VII. Assay of Ores for Copper and Tin. VIII. Platinum and the Platinum Group. IX. Metallurgical Laboratory Experiments and Notes. These notes, it is stated, are chiefly those used by the third-year and partly those used by the fourth-year Students in Assaying, in the Metallurgical Laboratory of the Massachusetts Institute of Technology.

Trade Report.

I.—GENERAL.

GERMAN CHEMICAL INDUSTRY; PROFITS IN THE —.

Eng. and Mining J., Dec. 1, 1904.

In the fiscal year 1903-4, comparatively few companies have shown increased profits, in fact, the more important among them have, by reason of keen competition, realized smaller earnings. Still, shareholders' dividends have been from 5 to 10 per cent. for the 12 months. The net profits of the Hönningen Chemical Company in 1903-4, amounted to 22,171*l.*, permitting the payment of a 10 per cent. dividend. The Stassfurt Company, with a share capital of 150,000*l.*, showed net profits of 15,439*l.*, and a dividend of 8 per cent., while the United Company, of Leopoldshall, from net profits of 15,602*l.*, declared 5 per cent. on its preferred stock, and 2 per cent. on the common. Although it gained 344*l.* in net profits to 10,705*l.*, the Byk Chemical Works, of Berlin, paid a dividend of 6 per cent., against 7 per cent. a year ago. The Wilhelmsburg Chemical Company, of Hamburg, cut its dividend rate from 8 to 6 per cent.; the Paul Gudden Colour and Tar Products Company, of Leipzig, from 6.5 to 5.5 per cent., while the North German Chemical Company, of Harburg, paid only 6 per cent. on the preferred, nothing on the common, and the Union Company, of Stettin, increased its rate from 8 to 9 per cent. The Dusseldorf Color Works, reports net profits of 1,400*l.*, as against a heavy loss in 1902-3. A forecast for the year 1904-5 suggests that the increased activity and better prices ruling will result in a substantial improvement.

JAPANESE CHEMICAL INDUSTRY.

Chem. and Druggist, Dec. 10, 1904.

Although chemical industry is in a flourishing condition in Japan, no prospects are offered to European chemists, in consequence of the number of Japanese who have studied in Europe, or at the high schools in Tokio or Kioto. There are at present 840 factories in Japan employing chemists. Two of these undertakings employ over 500 workmen, 86 over 100, 207 over 50, and 348 have 30 men employed. Altogether there are 38,591 men and women at work in various chemical works. The Japanese Government contributes largely towards promoting this branch of industry, and last year there were 79 Government laboratories, whose duty it is to ascertain and impart the methods of utilising the numerous varieties of seaweed and other fishery products, which are so plentiful in Japanese waters.

II.—FUEL, GAS, AND LIGHT.

COAL BRIQUETTES IN INDIA.

Eng. and Mining J., Dec. 1, 1904.

During the year 1902, 13,400 tons of patent fuel were made in India. Khost (Baluchistan) produced nearly 7,000 tons, and Dandot (Panjab) over 6,000 tons. During the official year 1903-1904, 14,513 tons were manufactured at Khost with an outlay of 190,000 Rs. The fuel is used on the railways. There is a small plant also at Giridih (Bengal), but since the installation of modern coke-ovens it has been little used.

RUSSIA; COAL INDUSTRY OF —.

Bd. of Trade J., Dec. 1, 1904.

The coal production of Russia for the past three years is shown in the subjoined table.—

	1901.	1902.	1903.
	Thousands of Pounds.	Thousands of Pounds.	Thousands of Pounds.
South Russia	694,420	642,140	728,090
Poland	258,915	263,320	295,180
Ural	30,255	33,202	30,080
Moscow district	16,007	12,814	13,919
Caucasus	3,342	2,034	2,210
Total { 1,000 of pounds	1,002,939	953,512	1,069,450
Tons	27,850,000	26,486,000	29,707,000

The destination of the coal produced in the Donetz basin during the past two years was as follows :—

	1902.	1903.
	Thousands of Pounds.	Thousands of Pounds.
Railways	141,257	166,937
Salt mines	5,600	5,167
Shipping	11,262	11,596
Gas works	2,770	4,282
Sugar refineries	38,154	41,924
Foundries	110,338	119,787
Manufactories of machinery	19,422	22,058
Other manufactories	25,188	33,531
Towns of Kharkov, Ekaterinoslaw, Rostov, and Taganrog }	15,726	13,329
Exported through Taganrog	51,607	37,462
Other consumers	52,729	61,878

During 1903, the Russian railways consumed 166,937,000 pounds of coal from the Donetz basin, 44,218,449 pounds from Poland, 6,500,000 pounds from the Moscow district, and 34,000,000 pounds of imported coal.

The distribution during the past two years of the coal produced in Poland, which is not suitable for gasworks, is shown below :—

	1902.	1903.
	Thousands of Pounds.	Thousands of Pounds.
Railways	34,781	43,218
Foundries	29,628	34,403
Denaturating works	18,227	17,779
Sugar refineries	24,924	16,752
Other manufactories	76,314	92,840
Domestic consumption	50,683	54,854

Pound = 36 lbs.

III.—TAR PRODUCTS, PETROLEUM, Etc.

PETROLEUM; CALIFORNIA —.

P. W. Prutzmann. J. of Elect., 1904, 306—317.
Science Abstracts, B., 1904, 7, 939—940.

Out of twenty-seven counties in California, only seven are producing oil profitably, the remainder having either yielded nothing, or only very small quantities of oil. In the seven producing counties, there are 14 centres of production, and on Dec. 31, 1903, the state of the industry was as follows :—Producing wells, 2998; abandoned wells, 1271; wells drilling, 159; uncertain, 322; total, 4750. Oil lighter than 20° B. is suitable for refining, the remainder being utilised for fuel purposes, or in the manufacture of asphalt. The total production of oil according to this classification is as follows :—Refining, 3,540,000 barrels; fuel, 21,070,000 barrels; thus averaging 27·7 barrels per well. The author devotes the remainder of the paper to describing the methods of refining employed, and the characteristic properties of Californian petroleum.—T. F. B.

VII.—ACIDS, ALKALIS, Etc.

ROCK PHOSPHATE; NEW SOURCE OF —.

Bd. of Trade J., Dec. 1904.

A large deposit of rock phosphate, testing 63 to 68 per cent. of tribasic calcium phosphate, has been discovered about 35 kilometres from the deposit at Metlaoui. In 1906 when this new mine—"Redeyef"—will be connected with the Sfax-Metlaoui railroad, the export of this new phosphate will be commenced.

VIII.—GLASS, POTTERY, AND ENAMELS.

GARNET; A NEW SOURCE OF —.

Eng. and Mining J., Dec. 1, 1904.

The use of garnet as an abrasive is firmly established in certain manufacturing industries, and there is little doubt that this material will continue to find favour, notwithstanding the great expansion in the utilisation of other abrasives, particularly corundum and carborundum. In the United States the production of garnet now amounts to over 4,000 tons yearly, and the value of the yearly product approximates 150,000 dols. The principal supplies hitherto have been derived from the Adirondack region of New York, smaller quantities being obtained from Pennsylvania, Connecticut, and North Carolina. With the opening of some new quarries in the last-named State a larger output may be expected in the future from that section of the country. The properties are situated near Marshall, in Madison county. The garnet is of the almandine variety, and occurs in a band of chloritic schists, about 26 ft. wide, that can be traced on the outcrop for nearly a mile. The crystals are of large size, averaging 2 in. in diameter, and often exceeding this limit. While somewhat altered to chlorite near the surface, the garnet in the deeper workings is perfectly fresh, and breaks into clean, sharp particles, so that a very pure abrasive material can be obtained. Its hardness, according to the usual scale, is about 7·5.

The property is well situated for railroad transportation, being on the main line of the Southern Railway running from Salisbury, N.C., to Chattanooga, Tenn. Active quarrying was begun in January of the present year, since which time a large quantity of garnet has been taken out and shipped to market.

IX.—BUILDING MATERIALS, Etc.

CEMENT PRODUCTION OF THE UNITED STATES.

Bd. of Trade J., Dec. 8, 1904.

A report issued by the Department of the Interior, at Washington, states that the total production of hydraulic cement in 1903 was 29,899,140 barrels, valued at 31,931,341 dols., as compared with 25,753,504 barrels, valued at 25,366,380 dols., produced in 1902. Of the total production in 1903, 22,842,973 barrels, having a value of 27,713,319 dols., were Portland cement. The production of natural-rock cement was 7,030,271 barrels, valued at 8,675,520 dols. The production of Pozzuolana or slag cement was 525,896 barrels, valued at 542,502 dols.

The increased production of Portland cement in 1903 resulted in a glutted market, which made the artificial product so low in price in the eastern part of the country as to seriously interfere with the production of natural-rock cement. Many of the plants whose output is exclusively the natural cement were for this reason shut down during a large part of the year.

X.—METALLURGY.

MINERAL PRODUCTION OF NEW ZEALAND IN 1903.

Bd. of Trade J., Dec. 8, 1904.

The annual report of the Minister for Mines contains the following particulars of the quantities and values of

the chief mineral products exported from and coal used in New Zealand during the years 1902 and 1903:—

	1902.		1903.	
	Quantity.	Value.	Quantity.	Value.
Gold.....	Ozs. 508,045	£ 1,951,433	Ozs. 533,314	£ 2,037,831
Silver.....	674,195 Tons.	71,975	911,914 Tons.	91,407
Copper ore.....	..	..	6	123
Manganese ore .....	..	..	70	210
Chrome ore	175	525	..	..
Mixed minerals	415	4,428	625	7,014
Hæmatite	17	116	..	1
Coal exported	188,877	154,747	152,332	128,927
Coal used in New Zealand.....	1,174,025	587,012	1,267,861	633,931
Kauri gum	7,430	450,223	9,367	631,102
Shale (treated in New Zealand)	2,338	1,169	36	18
Total value ...	..	3,221,621	..	3,530,654

IRON AND STEEL IN RUSSIA.

Eng. and Mining J., Dec. 1, 1904.

Official figures recently published show that the production of pig iron in Russia in 1903 was 2,453,953 tons, a decrease of 106,191 tons from the previous year. The output by districts was as follows:—North Russia, 22,462 tons; Moscow, 95,594; South Russia, 1,366,437; Poland, 308,914; Ural, 660,546 tons. In Poland there was an increase of 26,612 tons over 1902; all the other districts showed decreases, the most important being in the Ural, where it was 69,797 tons. The production of iron castings, or foundry work, was 209,000 tons, an increase of 19,000 tons. The wrought, or puddled, iron reported, in finished forms, was 194,000 tons, a decrease of 83,000 tons. In steel production, however, there was an increase of 315,000 tons, or 15 per cent, the total being 4,325,510 tons.

	1902.	1903.
Pig iron produced	2,500,000	2,454,000
Imported as pig	18,000	13,000
Imported in finished forms	827,000	356,000
Total consumption.....	2,905,000	2,803,000

Country.	Factories in Operation.		Beets.		Sugar (in terms of Raw).	
	1903-4.	1904-5.	1903-4.	1904-5.	1903-4.	1904-5.
Austria-Hungary	215	206	Met. Tons. 7,775,500	Met. Tons. 6,165,000	Met. Tons. 1,158,800	Met. Tons. 914,800
Germany	384	375	12,706,500	9,933,000	1,929,400	1,518,000
France	298	275	6,441,500	4,686,000	794,400	614,300
Belgium	100	90	1,550,000	1,267,000	202,800	179,100
Holland	29	26	680,000	908,000	123,500	153,900
Russia	275	276	7,705,300	6,580,000	1,160,700	948,400
Sweden	17	18	748,400	591,000	107,200	83,200
Denmark	7	7	380,000	340,000	48,000	48,000
Italy	32	32	1,000,000	700,000	135,000	80,000
Total.....	1,355	1,305	39,187,200	31,170,000	5,859,800	4,531,700

The authoritative publication from which the above data are taken calculates the quantities available for export from the beet-sugar countries during the current sugar year (1904-5) as shown in next column.

In the year 1903-4 Great Britain alone took 1,400,000 tons of sugar (in terms of raw), and the sugar stocks of the world are now over 400,000 tons less than a year ago, hence there is some reason to anticipate a scarcity of supply in the European sugar markets during the current sugar season. These facts have already resulted in higher prices. But an increase of price is bound to benefit cane sugar as well, and thus strengthen the competition on the part of the tropical product by causing its entrance into

The proportion of steel made by the various methods was: Bessemer, or converter, 24.3; open-hearth, 75.6; crucible, 0.1 per cent.

The approximate consumption of iron is given in the foregoing table, finished material and machinery being reduced to terms of equivalent pig-iron.

The consumption of iron per head in Russia is much less than that of any other European country. There is practically no iron nor steel exported from the country.

XIII. C.—INDIA-RUBBER, Etc.

RUBBER PRODUCTION OF PARÁ, 1899-1904.

Bd. of Trade J., Dec. 1, 1904.

The following particulars of the rubber production of Pará for the year, July 1903 to June 1904, as compared with the four previous years, are taken from the *Brazilian Review* of 25th October:—

Crop Years.	Quantity.	Value.
	Met. Tons.	£
1899-1900	9,957	2,862,400
1900-1901	9,247	2,647,185
1901-1902	10,333	2,799,720
1902-1903	11,327	3,069,000
1903-1904	11,362	2,907,641

Of the exports through Iquitos, Manaus, and Pará, during the year 1903-04, 12,163 metric tons of rubber and 3,338 metric tons of cauchó were sent to Europe, and 13,873 metric tons of rubber and 1,210 tons of cauchó to the United States of America.

XVI.—SUGAR, STARCH, Etc.

BET-SUGAR PRODUCTION OF EUROPE FOR THE 1904-5 SEASON.

U.S. Cons. Rep., No. 2119, Nov. 29, 1904.

The *Wochenschrift des Centralvereines für Rüben-Zucker-Industrie* gives the following results of the latest inquiry made by the Internationale Vereinigung für Zuckerstatistik regarding the probable sugar output for the current sugar season of 1904-5. These are preliminary estimates, subject to correction when the results of the second inquiry become known, which inquiry is undertaken later in the season:—

markets which until lately were held securely and exclusively by European beet sugar.

Country.	Production.	Consumption.	Available for Export.
	Met. Tons.	Met. Tons.	Met. Tons.
Austria-Hungary	915,000	450,000	465,000
Germany	1,518,000	980,000	538,000
France	614,000	580,000	34,000
Belgium	179,000	80,000	99,000
Holland	134,000	80,000	54,000
Total	3,360,000	2,120,000	1,240,000

XVII.—BREWING, WINES, SPIRITS, Etc.

ALCOHOL IN FRANCE; PRODUCTION, IMPORTS, AND EXPORTS OF — IN THE SEASON 1903-4.

Z. Spiritusind., 1904, 27, 471.

The total production of alcohol in France in the season 1903-4 has been very much higher than in the previous year, as is shown by the following figures for the last five years:—1899-1900, 2,641,505 hl.; 1900-1, 2,799,543 hl.; 1901-2, 2,026,212 hl.; 1902-3, 1,729,652 hl.; 1903-4, 2,200,725 hl. The whole of the increased production is from industrial distilleries, that of the private distilleries showing a decrease from 77,748 hl. to 37,437 hl.

The following statistics show the sources from which the industrial distilleries produced their alcohol in 1903-4, the figures in brackets being those for 1902-3: Wine, 36,663 hl. (37,342 hl.); marcs, 34,220 hl. (18,730 hl.); grain, 368,562 hl. (322,007 hl.); beetroots, 1,084,163 hl. (499,965 hl.); molasses, 639,527 hl. (773,625 hl.); other materials, 153 hl. (235 hl.).

Imports in 1903-4 amounted to 123,911 hl., and exports to 287,699 hl., while home consumption was 2,172,550 hl., and the stock at the end of the official year, 538,947 hl. The figures for the previous year were 87,715 hl., 279,091 hl., 1,774,341 hl., and 685,530 hl. respectively.—J. F. B.

SPIRIT-INDUSTRY; GERMAN —.

Chemist and Druggist, Dec. 3, 1904.

The German Chambers of Commerce of Nordhausen and Hanau, whose districts are especially interested in the spirit-industry, have appealed to the Federal Council requesting that regulations may be issued permitting the distillation of spirit from maize, in order to prevent the threatened scarcity and further increase in the prices of spirit and potatoes. In urging this petition the Chambers state that even though the spirit-production since October 1, 1903, is normal, the stocks of spirit on October 1, 1904, were lower by 40,000 hectolitres than the stocks at the same period of 1903. The petition also states that as the position is at present, it will require the best efforts of all distilleries to produce sufficient spirit for the demand in 1904-5. This will only be possible by exercising the greatest economy with potatoes. They are convinced that difficult times are ahead, and that a period of scarcity may be expected in the spring. In order to realise the consequences of this development, it is only necessary to point out the increase in price of methylated spirit, which has advanced by 10 M. per hectolitre since last year. The use of spirit for lighting, heating, and technical purposes, which for several years has increased in consumption by 100,000 hectolitres per annum, will also be greatly hampered, says the petition. As regards consumption for drinking purposes, this takes up almost two-thirds of the entire yearly production of those who are engaged in the brandy trade. The larger and richer distilleries will probably be able to weather the periods of unfavourable prices, but the smaller works will be placed in a most difficult position if the prices of brandy advance further. At present they are higher than they have ever been.

The present Secretary of the Treasury, Count Posadowsky, issued regulations in 1902 which were entirely in accordance with the wishes of the Spirit Ring. In these regulations it is not the taxation but the regulation of the production which requires remedying. When the last regulations in 1902 were issued, the spirit industry suffered from over-production, and naturally the Spirit Ring fitted the law to the immediate position. The Spirit Ring was founded in 1899. The production, which 10 years previously amounted to an average of 306.9 million litres, rose to 382.3 million litres in 1898-99, to 365.5 million in 1899-1900, to 406 millions in 1900-1, and 424.4 millions in 1901-2. On the basis of these regulations, the Spirit Ring ordained an artificial control of the production, and this has eventually brought about the present scarcity.

The *Berliner Tageblatt* reports that movements are on foot to amalgamate the Bank für Spirit- und Produktenhandel, Berlin, and the Posen Spirit Co., who own works

in Posen and Magdeburg. It is intended to bring about greater economies in the management of the business. The contracts of the Centrale with the spirit manufacturers and the agricultural distillers expire in 1908, and the Spirit Ring evidently hopes, by means of closer union, to be able to oppose more effectually any immoderate demands on the part of the distillers. The two companies in question have already stood in close relations with each other, and the director of the Centrale, Mr. Stern, and the rentier, Mr. Gutman, belong to the directorate of both companies.

SPIRIT MARKET; POSITION OF THE GERMAN — AT THE END OF OCTOBER 1904.

Z. Spiritusind., 1904, 27, 470.

The production of spirits in October was considerably greater than in the corresponding month of 1903 and 1902, but there is likely to be a shortness in the supply later on. There has been a marked falling off of the consumption in all branches. The decrease in duty-paid spirit for drinking is partly accounted for by the clearing of excessive supplies in September. The total issue of duty-free spirits shows a slight decrease as compared with October 1903. The decrease in the consumption of spirit for industrial purposes is due to the rise in the price of alcohol; these conditions are likely to continue for the present and to be attended by a decreased production. The whole of the decrease in the consumption of industrial spirits is due to fully denatured spirits. In the consumption of pure and partially denatured spirits, issued free of duty for industrial purposes, there has been a slight rise as compared with October 1903. The export of spirit in October this year has been merely nominal, and is likely to remain so; this trade has for the last few years been conducted at a loss. The position of the market at the end of October 1904 is shown in the following statement:—Stock at end of September, 260,668 hl.; production in October, 217,955 hl.; total available supply, 478,623 hl.; Consumption: for drinking, 180,938 hl.; duty-free industrial spirit, denatured, 64,480 hl.; pure or partially denatured, 36,542 hl.; exported, 223 hl.; total, 282,163 hl.—J. F. B.

XX.—FINE CHEMICALS, Etc.

CAMPOR MONOPOLY; THE JAPANESE —.

Schimmel's Report, Oct. 1904, 15.

The restrictions imposed on the camphor industry by the regulations of the Japanese Government monopoly, have induced experiments on the cultivation of *Cinnamomum camphora* in German colonies. Camphor trees are best grown from seed, which is gathered in the autumn and stored during the winter in sand. Before sowing in the spring, the dry seed is soaked in water for 24 to 48 hours, then sown $\frac{1}{2}$ to $\frac{3}{4}$ inch deep; the seedlings are transplanted when from 10 to 16 inches high. If the camphor is to be obtained from the leaves, the plants are arranged in hedges; but if distillation of the wood is to be performed, a space of 15 to 16 feet between each tree is allowed. The tree may also be propagated by layers or from cuttings. Experiments in this direction are being conducted at the German Biologico-agricultural Institute at Amanti, and also with the cultivation of *Druobalanops aromatica*, which yields Borneo camphor.—J. O. B.

ESSENTIAL OIL OF CEDAR WOOD.

Schimmel's Report, Oct. 1904, 18.

As lead pencils are now made from Florida cedar wood which is imported ready sawn, and not in logs as formerly, waste sawdust and turnings are becoming scarcer, causing an increase in the price of cedar-wood oil. In view of the growing demand, it may be necessary to import the wood in logs for the purpose of distillation, in which case a still further increase in price will follow.—J. O. B.

CITRONELLA OIL.

Schimmel's Report, Oct. 1904, 19.

Export.—After showing a decline of more than 200,000 lb. in 1903, compared with 1902, the shipments of citronella

oil from Ceylon again show an increase, 710,071 lb. being recorded as shipped to the end of July 1904 against 569,875 lb. for the corresponding period last year. The United States is the largest consumer, taking, this year, 325,419 lb.; 800,847 lb. have been shipped to the United Kingdom, and 37,459 lb. to Germany; France has only taken, direct, 235 lb. The above figures do not represent the consumption of the oil in the countries named since a large bulk is re-shipped to the Continent *via* London.

Control of Quality.—It is proposed to subject citronella oil for export to official supervision; oil which is found by Bamber's test (this J., 1904, 77) to contain not more than 1 per cent. of admixture being marked with the Government brand "Pure Oil," and sealed with a red official seal. Oils which contain admixture up to 10 per cent., by the same test, are to be marked "90 per cent. purity," and sealed with green seals. The export of all oils containing more than 10 per cent. of admixture is forbidden. Stations for examining the oil under this system are to be established at Galle and Colombo.—J. O. B.

BERGAMOT OIL.

Schimmel's Report, Oct. 1904, 27.

Higher prices may be expected to rule for Bergamot oil. The product of harvest, provided the fruits yield the normal amount of oil, is not expected to exceed 40,000 or 50,000 kilos., compared with 100,000 kilos. of the previous harvest. The bergamot orange trees were much affected by the hot dry weather which occurred at the end of the flowering, and prevented the proper setting of the fruit, causing enormous quantities of immature fruits to fall from the trees.—J. O. B.

LEMON OIL MARKET.

Schimmel's Report, Oct. 1904, 28.

Great fluctuations have taken place in the price of lemon oil. After reaching, in March last, the lowest figure recorded, 4 marks per kilo., a sharp upward movement to 5.25 marks, caused by large American purchases, took place in May. This was followed by a decline to 4.5 marks per kilo., at which price the oil has remained, until the reduction of stock to 25,000 kilos. caused a slight upward tendency. This small stock will probably be exhausted by the time the product of the new crop arrives on the market.

No exact estimates of the amount of the new crop are yet possible; it is expected that the total yield of oil will be about one-fifth below that of last year.—J. O. B.

ESSENTIAL OIL OF GERANIUM.

Schimmel's Report, Oct. 1904, 43.

In *Algeria*, the cultivation of geranium has been considerably increased, with the result that large quantities of oil have been put on the market, causing a fall in prices to 5 francs a kilo. The product of the recent harvest is of exceptionally good quality.

In *Réunion*, although great damage was done to the geranium plantations early in the year by a cyclone, after a temporary rise immediately following this disaster, prices have fallen to a lower figure than before, since the new plantations, requiring only four months to produce material for distillation, were in a position to supply oil in a relatively short period. Large stocks of oil had also accumulated which also tended to depress the market rate. The present stock at Marseilles is estimated at about 4,000 kilos. No change in price is anticipated.—J. O. B.

LAVENDER OIL.

Schimmel's Report, Oct. 1904, 50.

The dry weather of the past summer has had a general adverse effect on the French lavender crop, rendering the harvest yield only about one fourth of the normal quantity. No stocks appear to be held in France, so that very high prices will probably rule.—J. O. B.

NEROLI OIL INDUSTRY; FRENCH —.

Schimmel's Report, Oct. 1904, 60.

Although the blossom harvest in the Alpes Maritimes has been normal, with an estimated amount of 1,800,000

kilos., and the oil yield from these was favourable, a tendency to increased price is evident. This is due to dispute between the growers and the distillers. The former, driven by the unremunerative prices offered for the blossoms, have formed a syndicate for controlling the price, which is fixed at 65 francs per 100 kilos. If this be not conceded they intend to commence distilling themselves. It is stated that the growers' syndicate have actually distilled about 300 kilos. of oil this year, and have destroyed 40,000 kilos. of blossoms, which they could not deal with owing to lack of distilling plant. Arrangements are in progress which will enable the growers to distil the whole of next year's blossom crop should the distillers refuse to accept their terms.—J. O. B.

PEPPERMINT OIL INDUSTRY; AMERICAN —.

Schimmel's Report, Oct. 1904, 70.

Michigan and Indiana.—The severe winter of last year destroyed a large proportion of the plants, and rendered new roots for planting difficult to obtain. The total yield of oil from this district is estimated this year at between 137,000 to 140,000 lb.

Wayne County.—There are indications that the cultivation of peppermint on marshy land, which has been to a great extent abandoned during the past six years on account of the low market price of the oil, is being actively resumed. Black mint is the only plant cultivated, which under proper cultivation yields from 30 to 50 lb. of oil per acre. Much of the mint planted this year has not been distilled, but has been reserved for still further extending the crop for next season. The yield of black mint oil for 1904 is estimated at about 14,000 lb.—J. O. B.

PEPPERMINT OIL INDUSTRY; ENGLISH —.

Schimmel's Report, Oct. 1904, 74.

The yield of oil from this year's crop is the lowest recorded for 20 years, not amounting to more than half the average product. The bulk of the distillation has already been sold at prices 20 per cent. higher than those obtained in 1903. A further advance in price is therefore inevitable. The quality of the oil produced this year is good.—J. O. B.

PEPPERMINT OIL INDUSTRY; JAPANESE —.

Schimmel's Report, Oct. 1904, 75.

The high prices obtained last year have led to an important extension of the cultivation of peppermint in Japan, the product of the first crop in one district alone being estimated at about 200,000 kilos. A later crop from another district is anticipated to yield 72,000 kilos.; the total production of the whole of Japan will probably not fall below 300,000 kilos. In consequence of this large production, a heavy fall in prices has occurred both in menthol and in de-mentholised oil; the former declining from 18s. to 9s., and the latter from 5s. 9d. to 4s. In view of the upward tendency of the American peppermint-oil market, a further decline is not anticipated.—J. O. B.

PEPPERMINT OIL IN SAXONY.

Schimmel's Report, Oct. 1904, 76.

Despite the exceptional drought of the past summer the crop of peppermint oil in the neighbourhood of Miltitz has been good, yielding a high-grade oil. The dry weather, however, prevented the growth of a second crop.—J. O. B.

ROSE OIL [OTTO OF ROSE]; TURKISH —.

Schimmel's Report, Oct. 1904, 77.

The rose harvest this year has been favourable, and has given a yield of about 5000 kilos. of rose oil. This is not quite equal to the product of the 1903 harvest, when 6200 kilos. were obtained, but is in excess of an average yield. Up to the present about 2200 kilos. have changed hands, at prices near 500 marks, below which the so-called first quality oil has not yet fallen. The total export of otto of rose from April 1st, 1903, to April 1st, 1904, amounted to 6002 kilos., against 3624 kilos. for the same period in 1902—1903. Of this amount, France took 1834 kilos.;

America, 1403 kilos.; Germany, 1039 kilos.; and the United Kingdom, 913 kilos. An increase of price in rose oil is not expected.—J. O. B.

Patent List.

N.B.—In these lists, [A.] means "Application for Patent," and [C.S.] "Complete Specification Accepted."

Where a Complete Specification accompanies an Application, an asterisk is affixed. The dates given are (i) in the case of Applications for Patents, the dates of application, and (ii) in the case of Complete Specifications Accepted, those of the Official Journals in which acceptances of the Complete Specifications are advertised.

Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, AND MACHINERY.

- [A.] 24,832. Eldred. Heating process and reverberatory furnace. Nov. 28.
- " 24,836. Bruns. Process of and apparatus for making extracts, washing precipitates, purifying liquids, and like processes. Nov. 28.
- " 24,858. De Bavay. *See under X.*
- " 24,879. Wilton. *See under III.*
- " 25,892. Hesketh. Apparatus for depriving air of moisture previous to supplying it to blast furnaces, converters, &c. Nov. 28.
- " 25,966. Davis. Apparatus for heating or vaporising water or other fluid. Nov. 29.
- " 26,102. Lloyd and Sutcliffe. Drying appliance for hydro-extractors. Nov. 30.
- " 26,255. Neumann and Stade. Vacuum pans.* Dec. 2.
- " 26,270. Richards. Hot air driers. [U.S. Appl., June 20, 1904.]* Dec. 2.
- " 26,578. Barham. Apparatus for cooling or heating liquids. Dec. 6.
- " 26,602. Johnson (Badische Anilin und Soda Fabr.). *See under XI.*
- " 26,623. Mélotte. Centrifugal liquid separators. Dec. 7.
- " 26,669. Hudson and Crooke. *See under X.*
- " 26,670. Hudson and Crooke. *See under X.*
- " 26,978. E. Allen and Co., Ltd., Leach and Leach. Apparatus and appliances for drying slurry in the manufacture of cement, paints, colours, and the like. Dec. 10.
- [C.S.] 26,778 (1903). Blount and Middleton. Kilns or furnaces, especially applicable to kilns for burning lime, cement, &c. Dec. 7.
- " 26,822 (1903). Bolton. Apparatus for superheating steam. Dec. 14.
- " 28,087 (1903). Oxford and Buxton. Means of drying semi-liquids. Dec. 14.
- " 28,594 (1903). Lake (Trump). Process of drying and otherwise treating materials by air or other currents. Dec. 14.
- " 28,595 (1903). Lake (Trump). Apparatus for drying and otherwise treating materials by air or other currents. Dec. 14.
- " 28,617 (1903). Harvey. *See under XVI.*
- " 28,711 (1903). Harvey. *See under XVI.*
- " 2211 (1904). Lawrence. Trays for filter-presses. Dec. 14.
- " 2860 (1904). Dempster. Lutes for the covers of gas-purifiers and other receptacles for gaseous or vaporous substances. Dec. 7.

- [C.S.] 3050 (1904). Reeves and Bramwell. Apparatus for filtering liquids. Dec. 14.
- " 23,066 (1904). Lake (Caspar). Apparatus for drying granular and other like materials. Dec. 14.
- " 23,081 (1904). Kent. Furnaces. Dec. 7.
- " 23,942 (1904). Allison (Niles-Bement-Pond Co.). Filter-press plate. Dec. 14.

II.—FUEL, GAS, AND LIGHT:

- [A.] 25,844. Thorn. Incandescent gas mantle. Nov. 28.
- " 25,877. Neuman and Becker. Generators for the manufacture of generator-gas, water-gas, &c. Nov. 28.
- " 25,879. Wilton. *See under III.*
- " 25,997. Neuman. Manufacture of a mixture of coal-gas and water-gas. Nov. 29.
- " 26,057. Owensmith. Mantles for incandescent gas or oil burners. Nov. 30.
- " 26,074. Galley. Apparatus for the production of gas for illuminating, heating, or other purposes. Nov. 30.
- " 26,178. Vogt. Apparatus for producing combustion gases under pressure, for use as motive power, and means in combination therewith for producing a liquid jet. Dec. 1.
- " 26,246. Busse. Process and apparatus for the manufacture of illuminating gas. Dec. 2.
- " 26,300. Noll and Trainer. Manufacture of fuel briquettes.* Dec. 2.
- " 26,442. Herrick. Gas-producers. Dec. 5.
- " 26,493. Chalk Power Gas Syndicate, Ltd., and Pearson. Process for the continuous and concurrent production of fuel-gas and lime. Dec. 5.
- " 26,770. Fleischer. Process and apparatus for the manufacture of power-gas. [Ger. Appl., Dec. 11, 1903.]* Dec. 8.
- " 26,879. Williams. Purification of coal and other gases. Dec. 9.
- " 26,915. Dempster. Electrodes for arc lamps. [U.S. Appl., Dec. 10, 1903.]* Dec. 9.
- " 26,916. Steinmetz. Arc lamp electrodes. [U.S. Appl., Dec. 10, 1903.]* Dec. 9.
- " 26,917. Whitney. Electrodes for arc lamps. [U.S. Appl., Dec. 10, 1903.]* Dec. 9.
- " 26,918. Härden. Arc lamps, and electrodes therefor. [U.S. Appl., Dec. 10, 1903.]* Dec. 9.
- " 26,919. Härden. Arc light electrodes. [U.S. Appl., Dec. 10, 1903.]* Dec. 9.
- " 26,920. Lindsay. Arc light electrodes, and methods of making same. [U.S. Appl., Dec. 10, 1903.]* Dec. 9.
- " 26,921. Weedon. Electrodes for arc lamps, and methods of making same. [U.S. Appl., Dec. 10, 1903.]* Dec. 9.
- " 26,922. Weedon. Arc light electrodes. [U.S. Appl., Dec. 10, 1903.]* Dec. 9.
- [C.S.] 26,596 (1903). Schweich. Manufacture of producer gas and producers therefor. Dec. 7.
- " 26,974 (1903). Hartridge. Manufacture of artificial fuel. Dec. 14.
- " 27,361 (1903). Davies and Davies. Burning of liquid hydrocarbons. Dec. 14.
- " 27,362 (1903). Davies and Davies. Apparatus for burning liquid fuel. Dec. 14.
- " 576 (1904). Key. System for the manufacture of coke and gas, the construction of coke ovens and gas retorts, and the recovery of bye-products from same. Dec. 7.
- " 1393 (1904). Johnson (Deuts. Continental Gas-Ges., and Bueh). Manufacture of coal gas. Dec. 14.
- " 3794 (1904). Abel (Act.-Ges. f. Anilinfabr.). *See under XXI.*

- [C.S.] 11,105 (1904). Guenot. Manufacture of water-gas. Dec. 14.
 " 14,889 (1904). Gerdes. Manufacture of fuel blocks or briquettes. Dec. 14.
 " 23,444 (1904). Hill. Manufacture of incandescent gas mantles. Dec. 7.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM, AND MINERAL WAXES.

- [A.] 25,879. Wilton. Distillation, especially of tars or tarry products, and for use in the manufacture of carburetted water-gas and like processes. Nov. 28.
 " 26,192. Salasco and Rovere. Process for reducing the density of mineral and vegetable oils.* Dec. 1.
 " 26,198. Wynne. Process for purifying petroleum oils. Dec. 2.
 " 26,643. Macknight. *See under VII.*
 " 26,747. Bamlett. *See under IX.*
 [C.S.] 23,879 (1904). Zimpell. Sulphate of ammonia saturators. Dec. 14.

IV.—COLOURING MATTERS AND DYESTUFFS.

- [A.] 25,889. Johnson (Badische Anilin und Soda Fabrik). Reduction of indigo and similar colouring matters. Nov. 28.
 " 25,901. Imray (Soc. Chem. Ind. in Basle). Manufacture of brown monoazo dyestuffs developed by chroming. Nov. 28.
 " 25,998. Ransford (Cassella and Co.). Manufacture of nitroso compounds, and blue dyestuffs therefrom. Nov. 29.
 " 26,345. Read Holliday and Sons, Ltd., Turner and Dean. Black colouring matters containing sulphur. Dec. 3.
 " 26,361. Ransford (Cassella and Co.). Manufacture of benzene derivatives, and dyestuffs therefrom. Dec. 3.
 " 26,457. Newton (Bayer and Co.). *See under XIII. A.*
 " 26,477. Abel (Act.-Ges. f. Anilinfabr.). Manufacture of a new yellow sulphurised dyestuff. Dec. 5.
 " 26,643. Macknight. *See under VII.*
 " 26,908. Johnson (Badische Anilin und Soda Fabrik). Manufacture of azo colouring matter suited for use in the form of its lakes. Dec. 9.
 " 26,909. Johnson (Badische Anilin und Soda Fabrik). Manufacture of azo colouring matters especially suitable for use in the form of their lakes. Dec. 9.
 [C.S.] 25,738 (1903). Iljinskij, and R. Wedekind and Co. Manufacture of *o*-oxyanthraquinones and of *o*-oxyanthraquinone oxysulpho acids. Dec. 7.
 " 2468 (1904). Johnson (Badische Anilin und Soda Fabrik). Production of colouring matters of the naphthalene series. Dec. 7.
 " 2469 (1904). Johnson (Badische Anilin und Soda Fabrik). Manufacture of azo colouring matter especially suitable for the preparation of lakes, and of intermediate products. Dec. 14.
 " 2608 (1904). Johnson (Boehringer und Soehne). Manufacture of azo compounds. Dec. 7.
 " 3096 (1904). Ransford (Cassella and Co.). Manufacture of azo dyestuffs. Dec. 14.
 " 7725 (1904). Abel (Act.-Ges. f. Anilinfabr.). Manufacture of new sulphurised dyestuffs. Dec. 7.
 " 14,566 (1904). Lorrain (Bell). Dye-compound. Dec. 14.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

- [A.] 26,084. Fries. Machines for treating yarn.* Nov. 30.
 " 26,287. Bernhardt. Washing and rinsing machine for fibrous materials. Dec. 2.
 " 26,563. Thestrup. Composition for washing and bleaching. Dec. 6.
 [C.S.] 26,994 (1903). Kellner. Manufacture of thin threads from short fibres, particularly wood cellulose. Dec. 7.
 " 2167 (1904). Castle. Manufacture and water-proofing of leather, leather cloths, and all kinds of animal and vegetable fabrics. Dec. 7.
 " 2357 (1904). Howorth (Soc. Franç. de la Viscose). *See under XIX.*
 " 2573 (1904). Ransford (Cassella and Co.). Means for discharging dyeings. Dec. 14.
 " 2758 (1904). Hübner and Pope. Manufacture of calender bowls or rollers applicable for finishing textile goods, paper, and other fabrics, and for other purposes. Dec. 14.
 " 17,454 (1904). Mowbray, Black, and Warriner. Apparatus for multi-colour printing. Dec. 7.
 " 21,634 (1904). Könitzer. Production of oxidation black on animal fibres, mixtures of animal and vegetable fibres, and fabrics made from the same. Dec. 14.

VII.—ACIDS, ALKALIS, AND SALTS.

- [A.] 26,081. Woakes. *See under IX.*
 " 26,188. White. Process for the expulsion of water of crystallisation from metallic salts. Dec. 1.
 " 26,378. Mackenzie. Concentration of sulphuric acid, and apparatus therefor.* Dec. 2.
 " 26,493. The Chalk Power Gas Syndicate, Ltd., and Pearson. *See under II.*
 " 26,557. Boulton (Ashcroft). *See under XI.*
 " 26,643. Macknight. Process for treating soot for recovery of ammonia, pyridine, and aniline dye, and the production of a black pigment. Dec. 7.
 " 26,659. Stead. Carbonic acid gas producing apparatus. Dec. 7.
 " 26,790. Johnson (Deuts. Gold- und Silber-Scheide Anstalt, vorm. Röessler). Manufacture of metallic perborates.* Dec. 8.
 [C.S.] 25,867 (1903). Schütz. Production of carbonic acid. Dec. 7.
 " 27,249 (1903). Garuti and Pompili. *See under XI.*
 " 456 (1904). Leatham and Bousfield. *See under XI.*
 " 4217 (1904). Abel (Gebr. Siemens und Co.). Manufacture of barium oxide. Dec. 7.
 " 4796 (1904). Stanley. Preparation of nitrates and similar salts. Dec. 7.
 " 22,030 (1904). Posternak. *See under XVIII. A.*
 " 23,379 (1904). Zimpell. *See under III.*

VIII.—GLASS, POTTERY, AND ENAMELS.

- [C.S.] 2470 (1904). Gobbe. Apparatus for use in the manufacture of sheets and other articles of glass. Dec. 7.
 " 15,180 (1904). Fleming. Manufacture of earthenware. Dec. 14.
 " 17,073 (1904). Schütz. Apparatus for manufacturing hollow glassware. Dec. 7.
 " 23,492 (1904). Gacon. Manufacture of artificial emery. Dec. 7.)

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

- [A.] 25,829. Wohle and Hart. Composite material for architectural and other analogous purposes and for electrical insulation. Nov. 28.
- „ 25,837. Eldred. Process of burning cement. Nov. 28.
- „ 25,884. De la Roche. Silico-calcareous composition. Nov. 28.
- „ 26,059. Lichtenstein. Impregnation of wood. Nov. 30.
- „ 26,081. Woakes. Separating silica from earths and minerals. Nov. 30.
- „ 26,465. Illeman. Manufacture of insulating coverings for steam pipes, boilers, and the like.* Dec. 5.
- „ 26,516. Staudt. Manufacture of artificial stone compositions. Dec. 6.
- „ 26,747. Bamlett. Manufacture of asphalt and tar macadam. Dec. 8.
- „ 26,978. E. Allen and Co., Ltd., Leach and Leach. *See under I.*
- [C.S.] 26,778 (1903). Blount and Middleton. *See under I.*
- „ 26,899 (1903). Electric Timber Seasoning and Preserving Co., Ltd., and West. Treatment by impregnation of porous, cellular, and fibrous substances, and apparatus for the purpose. Dec. 14.

X.—METALLURGY.

- [A.] 25,858. De Bavay. Apparatus for separating by flotation parts of the constituents of ores and other solid bodies from the remainder thereof. Nov. 28.
- „ 25,882. Jacobsen. Manufacture of bronze. Nov. 28.
- „ 25,948. Soc. Electro - métallurgique Française. Manufacture of steel. [Ger. Appl., July 8, 1904.]* Nov. 29.
- „ 26,093. Lindemann. Crucible steel smelting furnaces, &c. Nov. 30.
- „ 26,610. Savigny and Douxami. Process for utilising the scorix derived from the reduction of antimony by means of iron. Dec. 6.
- „ 26,669. Hudson and Crooke. Method of extracting moisture from air and gases used in metallurgical and other operations. Dec. 7.
- „ 26,670. Hudson and Crooke. Method of removing moisture from air and gases used in metallurgical and other operations. Dec. 7.
- „ 26,849. Bailey. *See under XI.*
- „ 26,881. Perret. Process of treating ores of vanadium. Dec. 9.
- „ 26,947. Mills (Edison). Method and apparatus for cleaning metallic surfaces.* Dec. 10.
- „ 26,949. Mills (Edison). *See under XI.*
- [C.S.] 26,570 (1903). Winter. Process for manufacturing plated wire. Dec. 7.
- „ 27,398 (1903). Dawes. Magnetic separators for ores, &c. Dec. 14.
- „ 28,590 (1903). Cowper-Coles and Co., Ltd., and Cowper-Coles. Coating metals with copper. Dec. 7.
- „ 3087 (1904). Johnson. *See under XI.*
- „ 20,160 (1904). Gillies. Apparatus for recovering zinc and other sulphides from their ores by the wet or chemical process. Dec. 7.
- „ 23,331 (1904). De Dion and Bouton. Manufacture of case-hardened articles of chrome-nickel steel. Dec. 14.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

- [A.] 25,829. Wohle and Hart. *See under IX.*
- „ 25,839. Thorp. Electrolysing apparatus. Nov. 28.

- [A.] 25,902. Ekstromer Accumulator Co., Ltd., and Oppermann. Secondary batteries. Nov. 28.
- „ 26,557. Boulton (Ashcroft). Process and apparatus for producing metals of the alkali group by electrolysis. Dec. 6.
- „ 26,602. Johnson (Badische Anilin und Soda Fabrik). Production of reactions in gases by means of electric arcs. Dec. 6.
- „ 26,786. Hardingham (Felden und Guillaume Carls-werk Act.-Ges.). Means for rendering the insulation of electric conductors fireproof. Dec. 8.
- „ 26,849. Bailey. Apparatus for electro-deposition of metals. Dec. 9.
- „ 26,948. Mills (Edison). Storage batteries.* Dec. 10.
- „ 26,949. Mills (Edison). Continuous apparatus for nickel plating. Dec. 10.
- [C.S.] 27,249 (1903). Garuti and Pompili. Apparatus for collecting, separating, drying, or similarly treating oxygen and hydrogen generated by electrolysis of water. Dec. 7.
- „ 456 (1904). Leatham and Bousfield. Manufacture of chlorine by electrolysis sodium chloride solution, and apparatus therefor. Dec. 14.
- „ 3087 (1904). Johnson. Apparatus for amalgamating and coating metals or alloys with metals or alloys by aid of electricity. Dec. 14.
- „ 18,403 (1904). Townsend. Electrolytic process and apparatus therefor. Dec. 14.
- „ 21,402 (1904). Jungner. Electrodes for electric accumulators with variable electrolyte. Dec. 14.
- „ 23,622 (1904). Möllmann. Galvanic batteries. Dec. 7.

XII.—FATTY OILS, FATS, WAXES, AND SOAP.

- [A.] 26,192. Salasco and Rovere. *See under III.*

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, ETC.**(A.)—PIGMENTS, PAINTS.**

- [A.] 25,830. Wohle and Hart. Compound for use, in combination with pigments, for the preparation of paints. Nov. 28.
- „ 28,937. Hickman. Composition to be used as a coating for metallic surfaces for the prevention of corrosion. Nov. 29.
- „ 26,263. Samples. Oil paints. Dec. 2.
- „ 26,457. Newton (Bayer and Co.). Production of new colour lakes. Dec. 5.
- „ 26,643. Macknight. *See under VII.*
- „ 26,908. Johnson (Badische Anilin und Soda Fabrik). *See under IV.*
- „ 26,909. Johnson (Badische Anilin und Soda Fabrik). *See under IV.*
- „ 26,978. E. Allen and Co., Ltd., Leach and Leach. *See under I.*
- [C.S.] 2376 (1904). Hérisson. Manufacture of paints or pigments. Dec. 7.
- „ 2469 (1904). Johnson (Badische Anilin und Soda Fabrik). *See under IV.*

XIV.—TANNING; LEATHER, GLUE, SIZE, ETC.

- [A.] 25,916. Head. Process of preserving skins. Nov. 29.
- „ 25,984. The Sunbury Leather Co., Ltd., and Miller. Manufacture of leather. Nov. 29.
- „ 26,778. Payne. Improvements in tanning, and in the treatment of waste tanning materials and liquids. Dec. 8.
- [C.S.] 26,049 (1903). Dolat. Process for the preparation of skins. Dec. 7.
- „ 2167 (1904). Castle. *See under V.*
- „ 22,932 (1904). Wetter (Thüringer Gelatine-Fabrik, E. Jetter und Krause). Gelatine or gelatinous foodstuffs. Dec. 7.

- [C.S.] 23,016 (1904). Dougherty. Machines for mechanically seasoning, oiling, or otherwise treating skins. Dec. 14.

XVI.—SUGAR, STARCH, GUM, Etc.

- [C.S.] 27,666 (1903). Harvey (Naudet and Hinton). Treatment of sugar cane, beetroot, and the like. Dec. 7.
- " 28,617 (1903). Harvey. Evaporators for the treatment and concentration of cane juice, beet juice, and other juices and liquids. Dec. 7.
- " 28,711 (1903). Harvey. Evaporators for concentrating sugar cane, beet, and like juices or liquids. Dec. 7.

XVII.—BREWING, WINES, SPIRITS, Etc.

- [A.] 26,698. Board and Board. The process of fermentation. Dec. 7.
- " 26,751. Hart. Method of and apparatus for use in the fining of beer and other like liquors.* Dec. 8.
- [C.S.] 2398 (1904). Ward. Device for agitating and aerating wort. Dec. 7.

XVIII.—FOODS; SANITATION, WATER PURIFICATION; & DISINFECTANTS.

(A.)—FOODS.

- [A.] 26,623. Mélotte. *See under I.*
- " 26,654. Mitchell. Process for the production of proteid. Dec. 7.
- " 26,905. Weitzmann. Process for refining and purifying coffee. [Appl. in Denmark, Sept. 27, 1904.]* Dec. 9.
- [C.S.] 26,495 (1903). Nesfield. Sterilisation of water and other liquids and of alimentary substances to render same potable or edible. Dec. 7.
- " 20,885 (1904). Combret. Alimentary products constituting a phosphated vinegar. Dec. 7.
- " 22,030 (1904). Posternak. Process for the production of soluble earthy alkaline and metallic salts of the organic phosphorus compound contained in vegetable foodstuffs. Dec. 7.
- " 22,952 (1904). Wetter (Thüringer Gelatine-Fabrik). *See under XIV.*
- " 23,177 (1904). Müller. Food preparations. Dec. 7.

(B.)—SANITATION; WATER PURIFICATION.

- [C.S.] 5467 (1904). Wehner. Apparatus for purifying water. Dec. 14.

(C.)—DISINFECTANTS.

- [C.S.] 4540 (1904). Kitching and Shirley. Disinfectants. Dec. 7.

XIX.—PAPER, PASTEBOARD, Etc.

- [A.] 26,434. Woods and Morgan. Manufacture of celluloid compounds. Dec. 5.

- [C.S.] 1857 (1904). Hawke. *See under XXI.*

- " 2357 (1904). Howorth (Soc. Franç. de la Viscose). Apparatus for treating viscose. Dec. 7.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

- [A.] 26,383. Loebell. Process for purifying crude viscine obtained from plants of the *ilex* class.* Dec. 3.
- " 26,649. Livingstone (Stein). Compound for use in medicine, and process of manufacturing the same. Dec. 7.
- " 26,713. Oberlander and The Alliance Chemical Co., Ltd. Manufacture of saccharine. Dec. 8.
- " 26,779. Zimmermann (Chem. Fabr. auf Actien, vorm. E. Schering). Manufacture of camphor. Dec. 8.
- [C.S.] 22,030 (1904). Posternak. *See under XVIII. A.*

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

- [A.] 25,897. Harris, Gillard, and Molyneux. Coating or preparation of paper or other material for photographic purposes. Nov. 28.
- " 26,066. Kelly and Bentham. Self-developing dry plate. Nov. 30.
- " 26,247. Morgan. Manufacture of sensitive photographic self-toning printing-out paper.* Dec. 2.
- " 26,456. Newton (Bayer and Co.). The pigment process, and new copying materials for use therein. Dec. 5.
- " 26,573. Clarke. Colour photography. Dec. 6.
- [C.S.] 1857 (1904). Hawke. Manufacture of sensitised copying papers. Dec. 7.
- " 2693 (1904). Hewitt and Miles. Photographic printing. Dec. 14.
- " 3794 (1904). Abel (Act.-Ges. für Anilinfabr.). Manufacture of flash-lights for photography. Dec. 7.
- " 22,958 (1904). Soc. Anon. des Plaques et Papiers Photographiques A. Lumière et ses Fils. Sensitised plates for a process of colour photography. Dec. 14.

XXII.—EXPLOSIVES, MATCHES, Etc.

- [A.] 26,146. Curtis's and Harvey, Ltd., and Hargreaves. Explosive compounds. Dec. 1.
- " 26,974. Luck. Manufacture of explosives. Dec. 10.
- " 27,005. Wetter (Westfälisch-Anhaltische Sprengstoff-Act.-Ges.). Priming or detonating compositions suitable for percussion caps. Dec. 10.

XXIII.—GENERAL ANALYTICAL CHEMISTRY.

- [C.S.] 28,262 (1903). Schlatter and Dentsch. Method of and apparatus for ascertaining the quantity of carbonic acid in furnace gases. Dec. 7.

Society of Chemical Industry.

President—SIR WILLIAM RAMSAY, K.C.B., F.R.S.

ANNUAL GENERAL MEETING

TO BE HELD IN

NEW YORK, U.S.A.,

From the 7th to the 12th of September, 1904.

(HEADQUARTERS - HOTEL SEVILLE, MADISON AVENUE and 29th ST.)

PROGRAMME

(as arranged by the General Committee appointed by the New York Section),

WITH

REQUEST FORMS

to be filled up by those Members who desire to take part in the

MEETING AND EXCURSIONS.

THE General Committee of Arrangements for the ANNUAL MEETING of the SOCIETY OF CHEMICAL INDUSTRY in New York, to be held from the 7th to the 12th of September, takes great pleasure in announcing that all the preparations, excepting some smaller details, have been perfected. The principal work to be done now is to ascertain the number of members and their ladies who intend to be present at the various functions and entertainments.

For this purpose an outline of the programme is given as follows:—

Wednesday, September 7th.*

At 9.0 p.m. INFORMAL RECEPTION; GREETING THE GUESTS of the Section at the Chemists' Club, 108 W. 55th Street. Admission by card only.

Thursday, September 8th.

At 10.0 a.m. COUNCIL MEETING at Havemeyer Hall, Columbia University, 116th Street and Amsterdam Avenue.

*At 10.30 a.m. GENERAL MEETING; ADDRESS BY SIR WILLIAM RAMSAY, in Gymnasium of Columbia University.

*At 1.0 p.m. LUNCHEON at Claremont, Riverside Park and 126th Street (walking distance from the University; carriages for those who prefer to ride). Price of ticket, \$2.00.

* Ladies invited.

Thursday, September 8th—cont.

*At 2.30 p.m. AUTOMOBILE RIDE through the upper part of the City.
Price of ticket, 80 cents.

At 7.30 p.m. ANNUAL DINNER at the Waldorf-Astoria, Fifth Avenue and 34th Street. Price of ticket, \$5.00, including wine.

(This charge covers only part of the expenses, the balance is met by an appropriation from the entertainment fund.)

Friday, September 9th.

Visits to manufacturing establishments and places of interest.

*8.30 p.m. ROOF-GARDEN RECEPTION at the Majestic Hotel, Central Park West and 72nd Street, if the weather is favourable. Price of Ticket, \$1.00.

Saturday, September 10th.

Visits to manufacturing establishments and places of interest.

8.30 p.m. SMOKER AND VAUDEVILLE ENTERTAINMENT at Liederkranz Hall, 111-119 East 58th Street. Price of ticket, \$1.50.

Sunday, September 11th.

*EXCURSION UP THE HUDSON RIVER. Steamer will leave foot of West 35th Street at 9.30 a.m. sharp. Dinner on board the steamer. Price of ticket, including dinner and wine, \$3.00.

Following is a list of manufacturing establishments and places of interest in and around New York for which invitations have been received and accepted. Additions will be made to this list.

Westinghouse, Church, Kerr & Co., Powerhouse for Pa. R. R. at Long Island City.
Consolidated Gas Co., Gas Works at Ravenswood, L.I.

New York Edison Co., Waterside Station, 38th-39th Streets and East River.

Schwarzschild & Sulzberger Co., Abattoir, 45th Street and First Avenue.

Nichols Chemical Co., Copper Refinery at Laurel Hill. (*Through the courtesy of this Company Luncheon will be served at the works.*)

*Carl H. Schultz, Mineral Water Manufacturing, 440, First Avenue, New York City.
(*Arrangements have been made by the Company to entertain 50 guests at Luncheon.*)

New Jersey Zinc Co., Spiegel Furnace, Hackensack Meadow.

Ehret's Brewery, 92nd Street, near Third Avenue, New York City.

Ruppert's Brewery, 92nd Street and Third Avenue, New York City.

Central Brewing Co., 68th Street and East River, New York City.

Pacific Coast Borax Co., Factory at Bayonne, N.J.

*Tiffany & Co., Jewels and Jewel Cutting and Setting.

*Metropolitan Museum of Art, Fifth Avenue and 82nd Street, New York City,
Bishop Collection of Jade; Morgan Collection of Porcelains; Gold Room, &c.

*American Museum of Natural History, Columbus Avenue and 77th Street, New York City, Gem Room, Bement Collection of Minerals, &c.

Arrangements have been made by the Ladies' Committee to entertain the ladies, while the gentlemen are occupied visiting establishments and attending functions to which ladies are not invited.

It is the accepted rule of the Society that members will not ask for permission to visit works where there are industries carried on in which they are personally interested, and it is understood that manufacturing establishments assume no liability for accidents which may occur to visiting members.

* Ladies invited.

Opportunities will be afforded during the Western trip of visiting manufacturing establishments in lines not represented in the New York list.

The Hotel Seville, Madison Avenue and 29th Street, has been selected as headquarters of the Society while in New York. Rooms can be obtained from \$1.50 per day upwards, and it is desirable that out-of-town members should select this hotel during their stay here. Additional charge for bath with room will be about \$1.00.

It is earnestly requested that as many members as possible will attend the banquet to be given at the Waldorf-Astoria on September 8th, in order to do honour to fellow members from over the sea. This banquet will be one of the most elaborate functions of the meeting. In order that all members may have an opportunity of meeting the President of the Society, Sir William Ramsay, and the President-Elect, Mr. Wm. H. Nichols, it has been deemed advisable to make a nominal charge only.

It is also hoped that all who possibly can, will accompany the guests of the section on the steamboat trip around New York in order that they may become better acquainted with the European members.

The itinerary of the Society's trip to St. Louis and return is the following:—

Monday, September 12th.

Leave New York	{ West 23rd Street,	7.55 a.m.
	{ Desbrosses Street,	8.0 a.m.
Arrive Philadelphia,		10.10 a.m.
All day in Philadelphia.		
Leave Philadelphia,		11.59 p.m.

Tuesday, September 13th.

Arrive Washington,	3.40 a.m.
Train to be side-tracked for occupancy until 9.30 a.m.	
Tuesday, Sept. 13th, and Wednesday, Sept. 14th, in Washington, D.C.	

Thursday, September 15th.

Leave Washington (via Pennsylvania Railroad),	4.30 a.m.
Arrive Harrisburg,	8.0 a.m.
Breakfast at Station Restaurant.	
Leave Harrisburg,	9.0 a.m.
Arrive Altoona,	1.0 p.m.
Luncheon at Logan House.	
Leave Altoona,	2.0 p.m.
Arrive Pittsburg,	5.30 p.m.

Friday, Sept. 16th, and Saturday, Sept. 17th, in Pittsburg.

Saturday, September 17th.

Leave Pittsburg (via the Pennsylvania Lines),	10.30 p.m.
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Sunday, September 18th.

Breakfast and Luncheon in Dining Car en route.	
Arrive St. Louis (via Vandalia Line),	4.30 p.m.
Monday, Sept. 19th, Tuesday, Sept. 20th, Wednesday, Sept. 21st, and Thursday, Sept. 22nd, in St. Louis.	
Train to be side-tracked in Exposition Grounds for occupancy.	

Thursday, September 22nd.

Leave St. Louis (via Chicago and Alton Railway),

11 40 p.m.

Friday, September 23rd.

Arrive Chicago,

8.30 a.m.

Friday, September 23rd, Saturday, September 24th, and
Sunday, September 25th, in Chicago.

Sunday, September 25th.

Leave Chicago (via Michigan Central Railroad),

11.30 p.m.

The Chicago Committee intends to take the visitors on Saturday night by boat to Milwaukee. The visitors will board the train in Milwaukee on Sunday in time to leave Chicago at 11.30 p.m.

Monday, September 26th.

Arrive Detroit,

7.30 a.m.

All day in Detroit.

Leave Detroit,

12.0 night.

Tuesday, September 27th.

Arrive Niagara Falls,

7.0 a.m.

Tuesday, September 27th, and Wednesday, September 28th,
in Niagara Falls and Buffalo.

Wednesday, September 28th.

The train will be taken from Niagara Falls to Buffalo after an early luncheon, but under all circumstances in time to leave Buffalo at 7 p.m.

Leave Buffalo (via New York Central and Hudson River Railroad), 7.0 p.m.

Thursday, September 29th.

Arrive Boston,

7.0 a.m.

In Boston the special train will be abandoned and visitors will leave on Friday night, September 30th, for New York by train. Anybody wishing to reach New York earlier will be at liberty to do so and proper railroad accommodation will be provided for him.

The date for the meeting and for the tour has been selected by the parent Society with the object of affording the members an opportunity of attending the International Congresses in St. Louis during the week beginning Monday, September 19th.

The Committee on Hotels and Transportation have contracted with the Pennsylvania Railroad for a thoroughly modern and up-to-date train of Pullman cars for the trip to St. Louis and back, and have also arranged for hotel accommodation in New York and the several cities to be visited, excepting St. Louis, where the party are privileged to occupy their own sleeping cars on the Fair Grounds. Should members desire not to do so, accommodation can be obtained at the "Inside Inn" on the Fair Grounds, or elsewhere in St. Louis, if they inform the Committee of their wishes in the matter.

Hotel accommodation at Washington, Pittsburg, Chicago, Buffalo, Niagara Falls and Boston, will be secured for those wishing them, if they will indicate whether they desire moderate or more elaborate quarters.

Only a limited number of American members can be accommodated on the special train carrying the guests of the Section, but should the Committee receive a sufficient number of applications it may be able to arrange to travel in two sections. Should there be more applicants than there is accommodation for, those making earliest application will be given preference.

It is estimated that about \$200.00 will pay the expenses for the Annual Meeting and the subsequent trip, including meals and railroad accommodation, \$95.00 being the charge for railroad fare and sleeping car accommodation. The expense after leaving New York will be principally for hotels and meals en-route, the amount of this cannot be accurately estimated at present. The Committee is assured by the local committees that the charges will be very small, covering only actual cost of banquets, luncheons and fares in visiting the several points of interest.

Over 90 (74 gentlemen and 18 ladies) from abroad have already signified their intention of accepting the Committee's invitation. This list is being added to from time to time, and it is hoped that the final number will be not less than 100.

The following are the programmes in the several cities to be visited, as far as at present formulated :--

PHILADELPHIA, Monday, September 12.

Drive from Depot to Independence Hall ; guests welcomed by the Mayor.

Drive to University of Pennsylvania, inspection of buildings and laboratories, &c.

(Through the courtesy of the University authorities luncheon will be served.)

Visit to U.S. Mint, Baldwin Locomotive Works.

Drive through Fairmount Park and up the Schuylkill and Wissakickon, returning to the Country Club near Bala, where dinner will be served. American members desiring to participate in this will be charged a small amount per plate. Special train will await party in the vicinity.

For those who desire to visit industrial establishments in the afternoon, instead of taking the drive through the park, a list of establishments that will admit visitors on presentation of ticket of membership has been prepared by the local committee, who will afford all needful information. A complete list of these establishments will be available at the time the Meeting begins in New York.

WASHINGTON, D.C., Tuesday, Sept. 13, and Wednesday, Sept. 14.

Reach Washington early on the morning of September 13th ; remain in the sleeping cars until 7 o'clock.

9 a.m. to 12 noon. A ride on "Seeing Washington" cars, starting from 15th and G Streets. Guests free ; American and Canadian members 50 cents.

1 p.m., Lunch at Heurich's Brewery, free to all.

3 p.m. to 6 p.m., Trolley ride to Cabin John's bridge. Round trip, 20 cents.

8 p.m., Cake walk and smoker at Rauschers. Guests free ; Canadian and American members, \$1.50. Visiting ladies and members of ladies' reception committee are expected to attend.

September 14. 9 a.m. to 12 noon, visiting public buildings ; car fare 25 cents.

2 p.m., trip to Mt. Vernon by boat or rail. Guests free, American and Canadian members \$1.00.

PITTSBURG, Pa., Thursday, Sept. 15, Friday, Sept. 16, Saturday, Sept. 17.

Thursday Evening, Sept. 15.—Informal Reception at Hotel Schenley.

Friday, Sept. 16.—(Gentlemen) Westinghouse Electric Co. (Machine or Air Brake).

Lunch at Kennywood Park.

Duquesne Blast Furnaces and Steel Works.

Boat up Monongahela, if possible by daylight, return after dark, Smoker on board.

PITTSBURG, Pa.—cont.

Saturday, Sept. 17.—(Gentlemen) Visits in smaller groups to Plate Glass Works.

Phoenix Glass Co.
Pressed Steel Car Co.
Harbison & Walker (Fire Brick).
Ward-Mackey Co. (Bakery).
H. J. Heinz Co.
Coal Mine.

Friday, Sept. 16.—(Ladies) Drive through residential district and parks.

Phipps Conservatory.
H. J. Heinz Co.
Boat Excursion with gentlemen.

Saturday, Sept. 17.—(Ladies) Ward-Mackey Co. (Bakery).

Afternoon—Concert at Exposition.

**ST. LOUIS, Mo., Sunday, Sept. 18, Monday, Sept. 19, Tuesday, Sept. 20,
Wednesday, Sept. 21, Thursday, Sept. 22.**

The St. Louis Programme will include the following functions:—

Sunday, Sept. 18.—Meeting of visitors on train by representatives of St. Louis Chemical Society.

Monday, Sept. 19.—Visit to the World's Fair. In the evening, Banquet given by the St. Louis Chemical Society (the visitors, officers of the Society of Chemical Industry and of the New York Section will be guests of the St. Louis Chemical Society. Admission for American and Canadian members, \$10.00).

Tuesday, Sept. 20.—Visit to the World's Fair. Afternoon luncheon to the ladies accompanying our guests.

Wednesday, Sept. 21.—Congress for Inorganic and Organic Chemistry.

Thursday, Sept. 22.—Congress for Technical, Physical and Physiological Chemistry.

CHICAGO, Ill., Friday, Sept. 23, Saturday, Sept. 24, Sunday, Sept. 25.

Chicago Board of Trade.
Drainage Canal.
Matthiessen-Hegeler Zinc Works.
Stock Yards.
Standard Oil Refinery at Whiting, Ind.
Illinois Steel Works.
Banquet and other entertainments to be announced later.

DETROIT, Mich., Monday, Sept. 26.

Guests of Parke, Davis & Co.

**BUFFALO AND NIAGARA FALLS, Tuesday, Sept. 27, Wednesday,
Sept. 28.**

Niagara Gorge by daylight, or special train at night with the gorge illuminated.
On the Canadian side reception by the Canadian Section.
Power Houses on American and Canadian sides.
Natural Food Co.
Visits to electro-chemical establishments.
Entertainment at the Ellicott Club.
Dinner at the Buffalo Club.

BOSTON, Mass., Thursday, Sept. 29, Friday, Sept. 30.

Thursday.—Lunch at Harvard University.

Visiting Colleges after Luncheon.

Tallyho drive through the country, stopping at the Country Club for tea and refreshments; return to Boston.

Thursday Evening programme to be announced later.

Friday Morning.—(Gentlemen) Parties will be formed to visit :

Print Works, Douglas Shoe Co., N. E. Gas and Coke Co., Fore River Ship and Engine Building Co., Cochrane Chemical Co., Merrimac Chemical Co., General Electric Co. at Lynn.

Friday Afternoon.—(Ladies and Gentlemen) Clambake at Squantum. The ladies will meet the gentlemen on the boat at 12.30 p.m.

Friday, 7.30 p.m.—Banquet.

Friday, midnight.—Leave for New York.

The following English Committee has been appointed by the President to make the necessary arrangements for the New York meeting:—The President, the Hon. Treasurer, Dr. Edward Divers, F.R.S., Dr. F. B. Power, Dr. Boverton Redwood, Dr. W. S. Squire, and Messrs. Thomas Tyrer, H. Hemingway, R. W. Greeff, T. J. Wrampelmeier, B. E. R. Newlands, and Walter F. Reid.

The General Committee has met once a month since its formation and will in future meet as frequently as may be necessary, and it is desirable that any communications which members may wish to send them with reference to the meeting be made as soon as possible. The Committee is subdivided as follows:—

EXECUTIVE COMMITTEE.

H. SCHWEITZER, Chairman.

T. J. PARKER, Secretary.

R. C. WOODCOCK, Treasurer.

Virgil Coblentz.

E. G. Love.

Always in session and will receive and act on any communications which require immediate attention.

COMMITTEE OF FINANCE.

W. H. NICHOLS, Chairman.

Chas. F. Chandler.

H. A. Metz.

T. J. Parker.

R. C. Woodcock.

Have been and are still collecting funds for the purpose of the meeting.

HOTEL AND TRANSPORTATION.

C. B. ZABRISKIE, Chairman.

Leo Baekeland.

DeLaguel Haigh.

Wm. F. Hoffmann.

Clifford Richardson.

Arrangements for the trip to St. Louis and back and for hotel accommodations in all cities visited have been made by them.

ENTERTAINMENT AND PROGRAMME.

E. G. LOVE, Chairman.

Leo Baekeland.

Marston T. Bogert.

Gustav Drobegg.

A. P. Hallock.

G. C. Stone.

Maximilian Toch.

Plans for the entertainment of guests and members during their stay in New York have been practically concluded and only smaller details need further attention.

INVITATION AND PRESS COMMITTEE.

E. J. LEDERLE, Chairman.

W. F. Fuerst.

R. W. Moore.

Wm. J. Schieffelin.

R. C. Schuepphaus.

H. W. Wiley.

D. Woodman.

Have invited prominent scientists and statesmen to be present at the meeting at Columbia University, and the banquet. A representative of the press will be in attendance, and both the American and English newspapers will publish daily matter pertaining to the Annual Meeting and the railroad trip.

RECEPTION COMMITTEE.

VIRGIL COBLENTZ, Chairman.

H. C. Aspinwall.

A. C. Bedford.

F. J. Butterworth.

W. B. Cogswell.

Thomas A. Edison.

William H. Erhart.

H. C. Grant.

Edward Hart.

J. Hasslacher.

A. C. Humphreys.

E. J. Lederle.

William McMurtrie.

Wm. H. Nichols.

Chas. Pellew.

Wm. J. Schieffelin.

F. Schniewind.

F. M. Smith.

I. F. Stone.

F. G. Zinsser.

Sub-Committees of the Reception Committee will meet the guests on arrival by steamer, and see them safely lodged in their hotels. They will also attend the several functions and introduce the guests to American and Canadian members.

LADIES' COMMITTEE.

MRS. CHARLES E. PELLEW, Chairman.

Miss Aspinwall.

Mrs. Leo Baekeland.

Mrs. Marston T. Bogert.

Mrs. Virgil Coblentz.

Mrs. Ernest J. Lederle.

Mrs. Herman A. Metz.

Mrs. William McMurtrie.

Mrs. Wm. H. Nichols.

Miss Parker.

Mrs. Thomas J. Parker.

Mrs. Clifford Richardson.

Mrs. Wm. J. Schieffelin.

Mrs. Hugo Schweitzer.

Mrs. Maximilian Toch.

Mrs. Fred. G. Zinsser.

A very interesting programme has been formulated for the entertainment of the ladies accompanying members from abroad. Similar committees have been formed for the same purpose in all the cities to be visited.

The local committees in the several cities to be visited consist of the following gentlemen :—

PHILADELPHIA COMMITTEE.

WM. WEIGHTMAN, Hon. Chairman.

SAMUEL P. SADTLER, Chairman.

Theo. Armstrong.

H. R. Baltz.

Daniel Baugh.

Edward T. Beale.

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Jas. F. Hope.

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M. N. Kline.

John B. Lennig.

Robt. W. Lesley.

J. Merritt Matthews.

R. V. Mattison.

Geo. McNeely.

Geo. D. Rosengarten.

Pedro G. Salom.

E. F. Smith.

D. K. Tuttle.

Joseph Wharton.

PITTSBURG COMMITTEE.

H. W. CRAVER, Secretary.

K. F. STAHL, Chairman.

H. K. PORTER, Treasurer.

Chester B. Albree.

Edward E. Armstrong.

Jas. M. Camp.

Jas. O. Handy.

John E. Hurford.

Geo. A. Macbeth.

A. G. McKenna.

Walter H. Stiefel.

Emil Swensson.

C. P. Tiers.

WASHINGTON COMMITTEE.

H. W. WILEY, Chairman.

Marcus Benjamin.
Eugene A. Byrnes.
T. M. Chatard.
David T. Day.
Fred. P. Dewey.
A. W. Dow.
Edwin C. Eckel.

Wm. S. Ferris.
Max Georgii.
John J. Griffin.
W. H. Heileman.
Lyman F. Kebler.
Jas. B. Littlewood.

Chas. E. Munroe.
R. Outwater.
Harry J. Patterson.
E. Richards.
Henry N. Stokes.
Samuel S. Voorhees.

This Committee is sub-divided as follows :—

Executive Committee :—H. W. WILEY, Chairman ; Marcus Benjamin, Chas. E. Munroe, Samuel S. Voorhees.

Finance Committee { *Washington* :—CHAS. E. MUNROE, Chairman ; T. M. Chatard, A. W. Dow.
Baltimore :—H. Burrough, Jr., A. R. L. Dohme, Chas. Glaser.

Entertainment Committee { *Washington* :—SAMUEL S. VOORHEES, Chairman ; Fred. P. Dewey, Eugene A. Byrnes.
Baltimore :—V. G. Bloede.

Press Committee :—Marcus Benjamin.

Ladies' Committee :—Mrs. Chas. E. Munroe, Mrs. Marcus Benjamin, Mrs. T. M. Chatard, Mrs. A. W. Dow, Mrs. Samuel S. Voorhees ; assisted by the wives of other members of the local committee.

ST. LOUIS COMMITTEE.

F. W. FRERICHs, Chairman.

Chas. E. Caspari.

August H. Hunicke.

Edw. H. Keiser.

Sherman Leavitt.

H. M. Whelpley.

Honorary Committee :—EDW. MALLINCKRODT, Chairman ; R. S. Brookings, W. S. Chaplin, Chas. P. Nagel.

BUFFALO AND NIAGARA FALLS COMMITTEE.

CHARLES E. ACKER, Chairman.

Edw. G. Acheson.
F. M. Becket.
G. F. Brindley.
C. H. Clowes.
Geo. W. Davenport.
S. P. Franchot.
Harry Gardiner.
Chas. M. Goodyear.
Francis V. Green.
A. Monroe Grier.

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C. M. Hall.
J. M. Hancock.
A. C. Hastings.
H. M. Hill.
H. A. Irvine.
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D. R. Lovejoy.
E. C. Lufkin.
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Roswell Park.
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E. F. Price.
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J. F. Schoellkopf.
Lee H. Smith.
T. Guilford Smith.
B. F. Thurston.

Francis D. Ward.

TORONTO COMMITTEE (CANADIAN SECTION).

Alfred Burton.

G. P. Girdwood.

W. R. Lang.

F. J. Smale.

BOSTON COMMITTEE.

GODFREY L. A. CABOT, Chairman.

HENRY HOWARD, Secretary.

W. H. WALKER, Treasurer.

F. E. Atteaux.

E. F. Billings.

A. L. Cochrane.

W. J. Webber.

Henry Wood.

ESTIMATED EXPENSES.

	\$
Hotel accommodation in New York, 5 days at \$1.50 per day	- 7.50
Railroad fares and Pullman accommodation	- 95.00*
Informal Luncheon at the Claremont	- 2.00
Seeing New York by Stages and Automobiles	- 0.80
Banquet	- 5.00
Average fare to Manufacturing Establishments (each day)	- 0.75
Roof-Garden Entertainment	- 1.00
Visit to Manufacturing Establishments, average fare (each day)	- 0.75
Smoker at Liederkrantz	- 1.50
Excursion by Steamboat around New York	- 3.00

* Not payable by guests from abroad. \$117.30

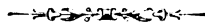
Add to this about \$3.00 per day expenses during 24 days
(September 7th to September 30th) - 72.00

\$189.30

Thus the cost of the Annual Meeting, including the trip to St. Louis and back, need not exceed \$200.00 for ordinary members and ladies, nor \$105 for guest-members. It is not to be understood from the above estimate that the whole sum should be forwarded to the Secretary; it is only necessary to send cheque covering expenses for selected functions. Guest-members from abroad may pay on arrival in New York, but should send in Request Form I. to Mr. Parker at once.

American and Canadian members should fill the blank spaces on the Request Forms giving details of the annual meeting and the railroad trip, and return the list enclosing cheque covering the functions in which it is wished to take part. Cheques to be made payable to the order of R. C. Woodcock, Treasurer, and mailed to Mr. Parker. **No attention can be paid to communications received after September 1st.** All communications should be addressed to T. J. Parker, Secretary, 25, Broad Street, New York City.

NEW YORK,
16th July, 1904.



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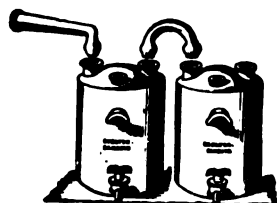
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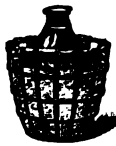
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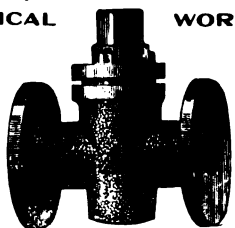
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Fig. 7001.
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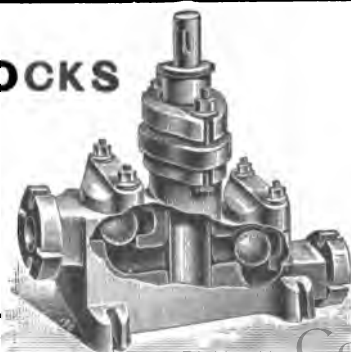


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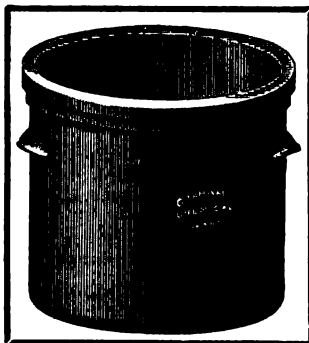
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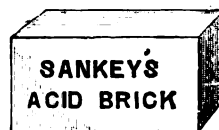
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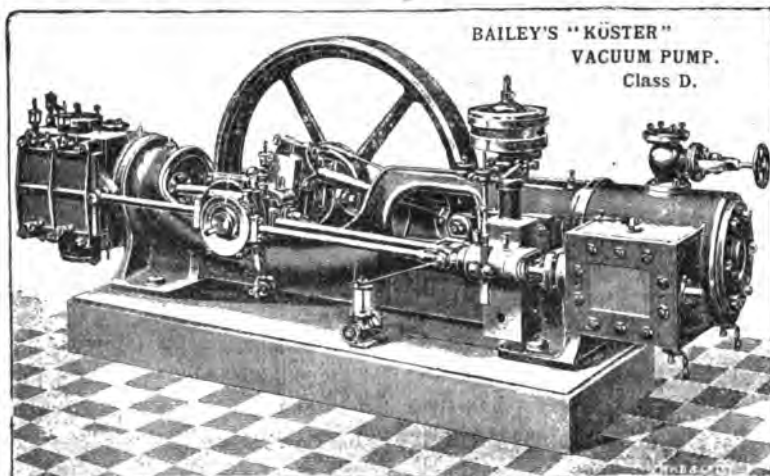
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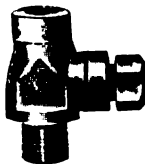
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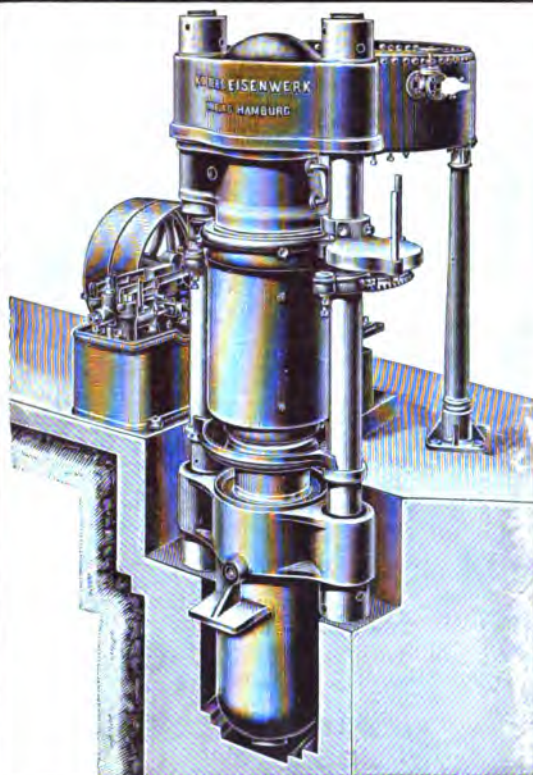
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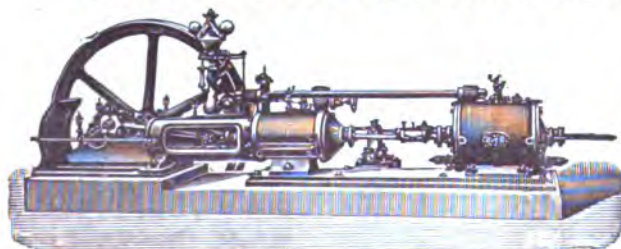
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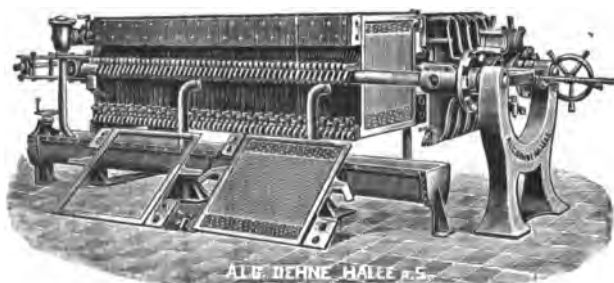
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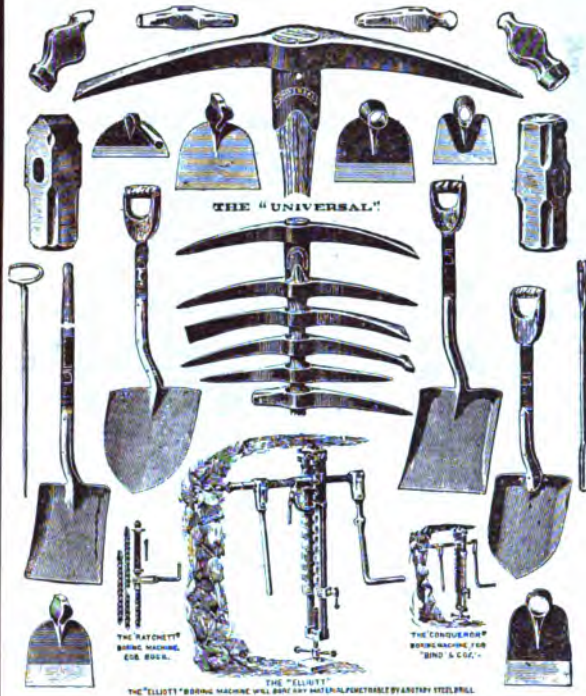


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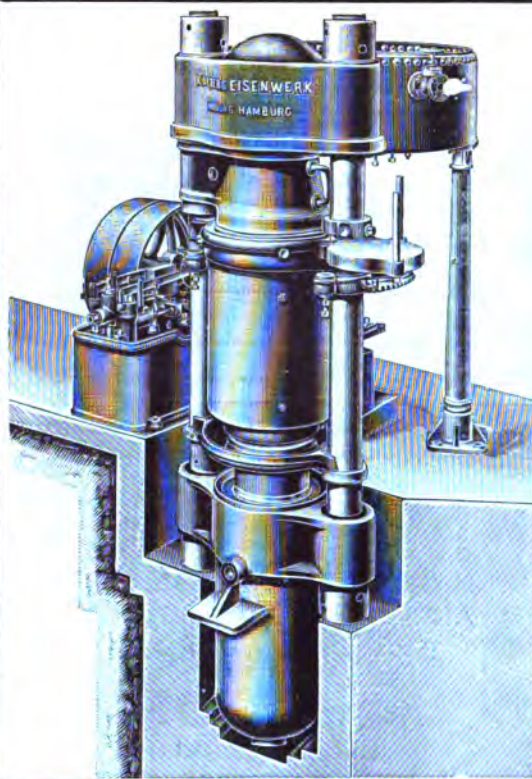
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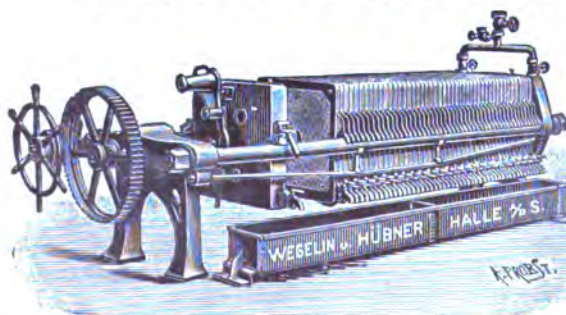
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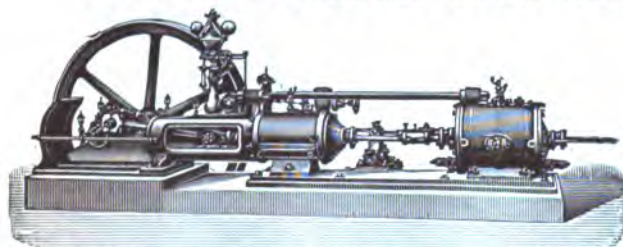
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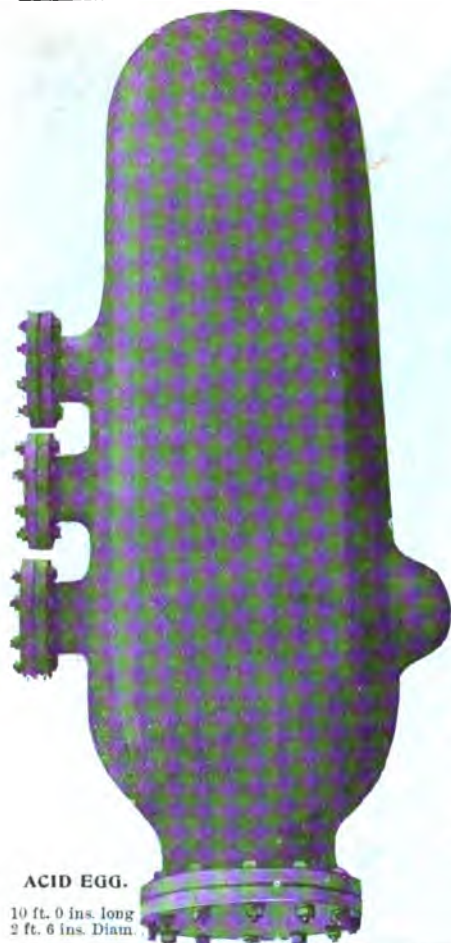
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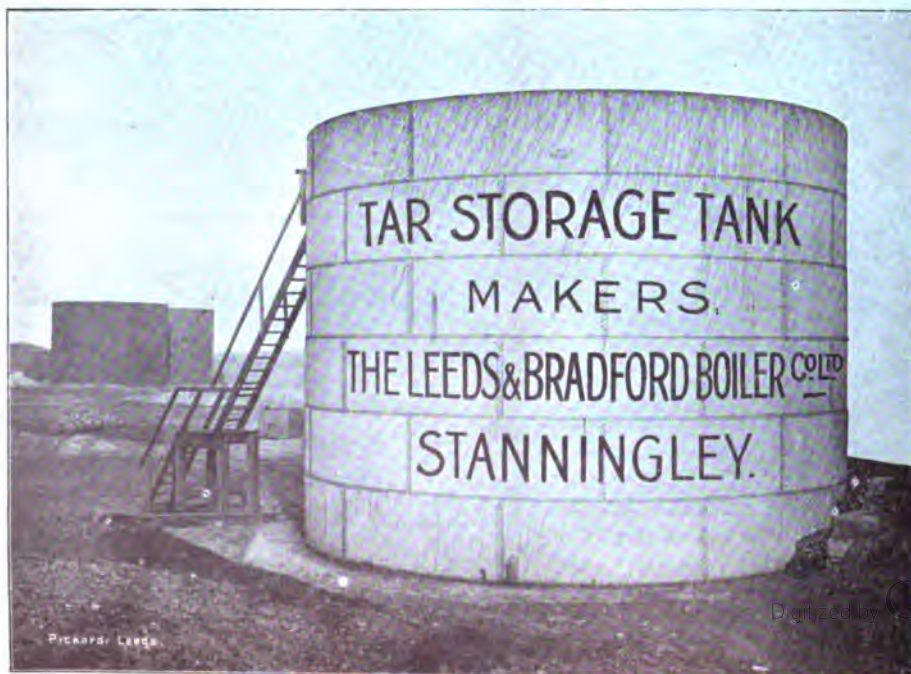


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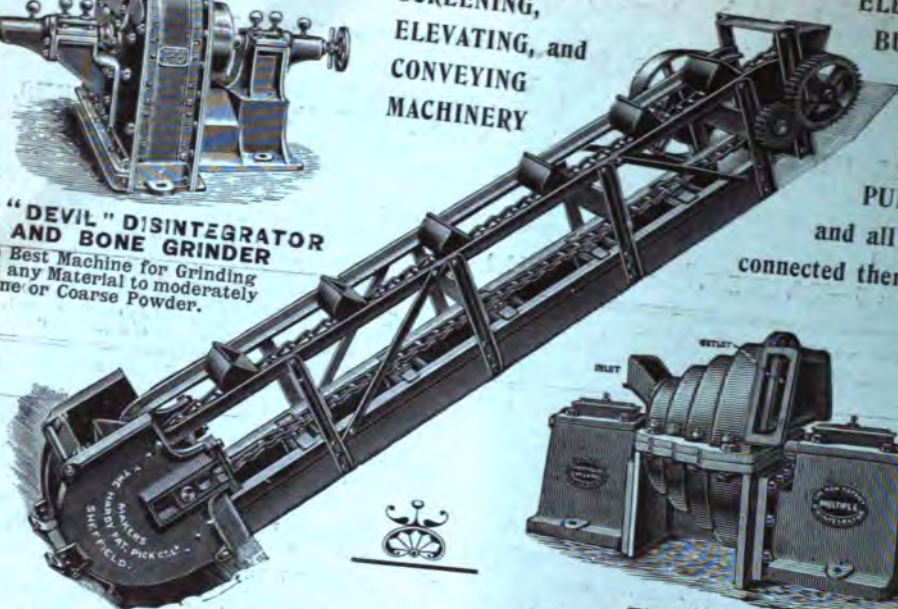
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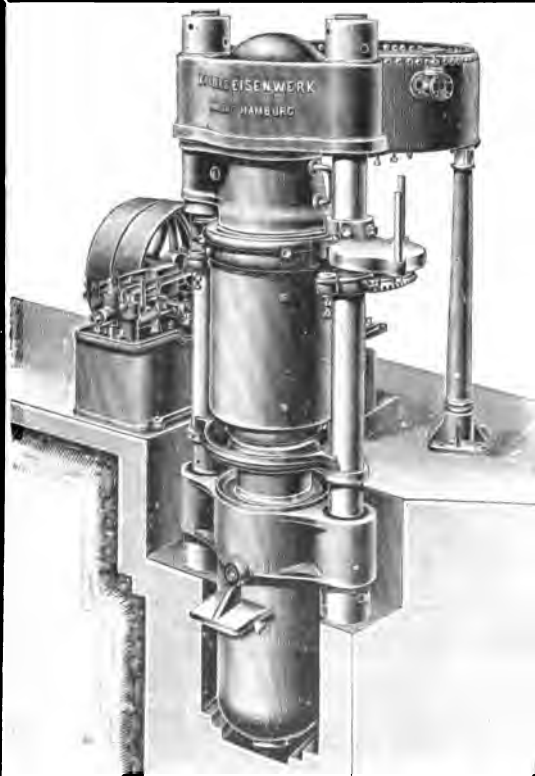
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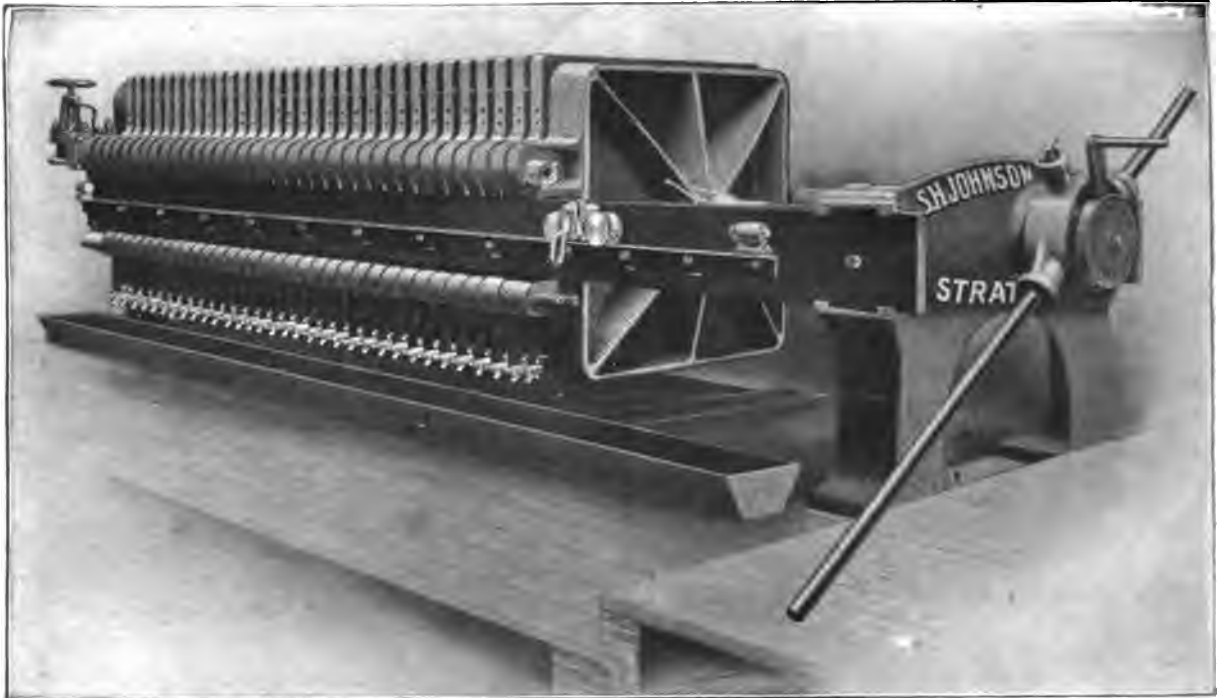
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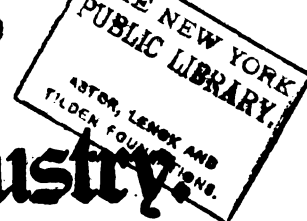
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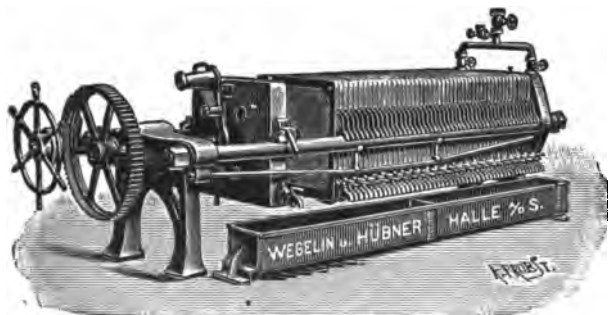
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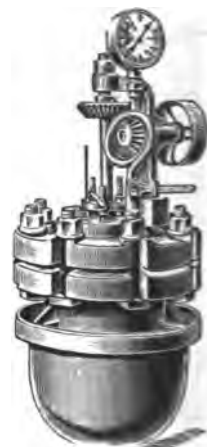
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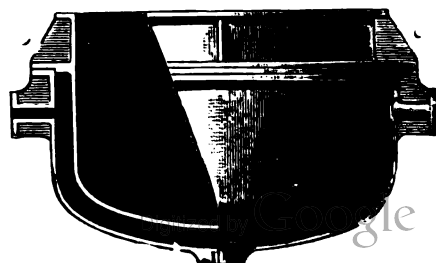
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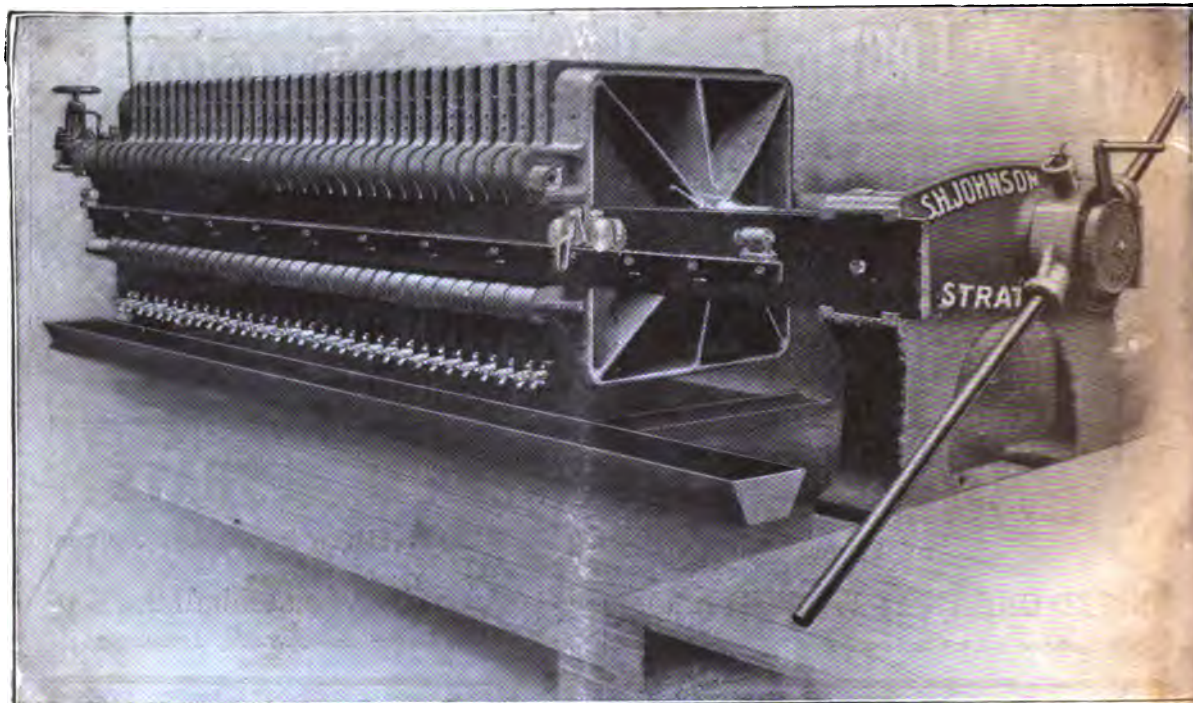
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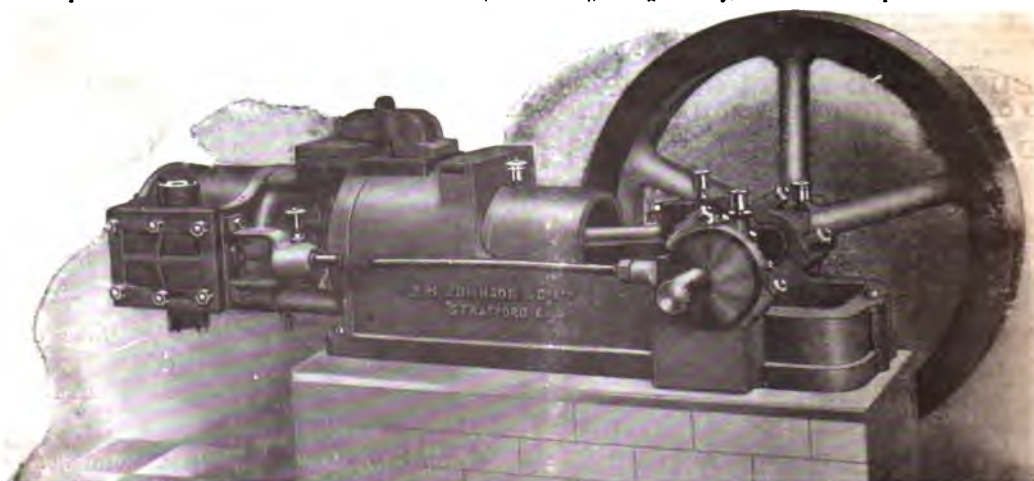
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